ET-7000/PET-7000 AIO Series User Manual

Version 1.0.1 beta0, October 2009

Service and usage information for

ET-7015

PET-7015

ET-7017

PET-7017

ET-7017-10

ET-7018Z

PET-7018Z

Written by Liam Lin

Edited by Anna Huang

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Table of Contents

Table of Contents **3**

1. Introduction **6**

1.1. Features 8

1.2. Module Selection 11

1.2.1. Part Naming Convention 11

1.2.2. Released Module 12

1.3. Specifications 13

1.3.1. System Specifications 13

1.3.2. I/O Specifications 14

1.4. Overview 22

1.4.1. Front Panel 22

1.4.2. Back Panel 25

1.5. Installation 26

1.5.1. Mounting the ET-7000/PET-7000 26

1.5.2. Connecting the hardware 28

1.5.3. Ethernet cable wiring 29

1.6. I/O wiring connection 30

1.6.1. ET-7015/PET-7015 30

1.6.2. ET-7017/PET-7017 31

1.6.3. ET-7017-10 31

1.6.4. ET-7018Z/PET-7018Z 34

1.7. Default Settings 35

1.8. Calibration and Adjustment 36

1.8.1. ET-7015/PET-7015 36

1.8.2. ET-7017/PET-7017 and ET-7017-10 41

1.8.3. ET-7018Z/PET-7018Z 43

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1.9. Companion CD 47
1.10. Update Information 47

2. Configuring the ET-7000/PET-7000 48

2.1. Configuring the network settings 48
2.1.1. Using the “MiniOS7 Utility” 48
2.1.2. Load Factory Default 51

3. Web Application 52

3.1. Overview 55
3.2. Configuration 56
3.2.1. Ethernet Settings 56
3.2.2. Basic Setting 58
3.2.3. Module I/O Settings 65
3.3. Authentication 68
3.3.1. Account management 68
3.3.2. IP filter Settings 70
3.4. Web HMI 72
3.4.1. Web Edit 72
3.4.2. Web HMI 78
3.5. I/O Pair Connection 88
3.6. More Information 90

4. How to access ET-7000/PET-7000 91

4.1. Via an Ethernet Network 91
4.2. Using the Modbus Protocol 92
4.2.1. Function codes supported 93
4.2.2. Modbus register address table 93

5. I/O Pair Connection 94

6. Software Development Application 95

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6.1. LabVIEW 96
6.2. OPC Server 97
6.3. SCADA 103
6.3.1. InduSoft 104
6.3.2. Citect 105
6.3.3. iFix 106

7. Troubleshooting 107

Appendix A. Dimensions 108

Appendix B. MiniOS7 Utility 110

Appendix C. Modbus Register Tables 117

C.1. Common Functions for all ET-7000/PET-7000 series modules 118
C.2. ET-7017/PET-7017 I/O Address Mapping 120
C.3. ET-7017-10 I/O Address Mapping 125
C.4. ET-7015/PET-7015 I/O Address Mapping 129
C.5. ET-7018Z/PET-7018Z I/O Address Mapping 132

Appendix D. Modbus Application Notes 138

D.1. Dual Watchdog 138
D.2. Power ON Value 139
D.3. Safe Value 140
D.4. AI High/Low Alarm 141
D.5. AI High/Low Latch 146

Appendix E. Frame Ground 150

Appendix F. Node Information Area 151

Appendix G. Technical Support 152

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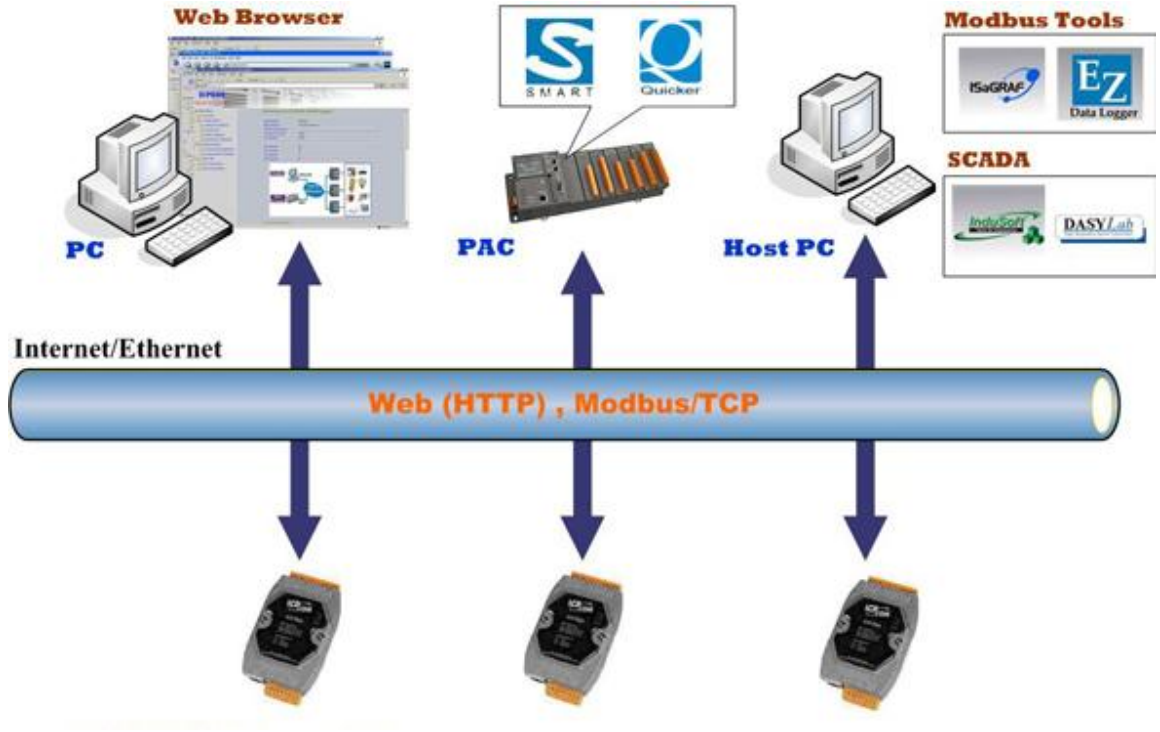
1. Introduction



The ET-7000/PET-7000, a web-based Ethernet I/O module, features a built-in web server, which allows configuration, I/O monitoring and I/O control by simply using a regular web browser. Besides, with the web HMI function, no more programming or HTML skills are needed; creating dynamic and attractive web pages for I/O monitoring and I/O control would be fun to engineers ever after. The ET-7000/PET-7000 offers easily and safely access for users from anytime and anywhere! In addition, ET-7000/PET-7000 also supports Modbus/TCP protocol that makes perfect integration to SCADA software.

The ET-7000/PET-7000 is a multi-function module, there are 6-channel analog inputs, 2-channel analog output, 2-channel digital inputs and 2-channel digital outputs module. It provides programmable input range on all analog inputs (+/-500mV, +/-1V, +/-5V, +/-10V, +/-20mA, 0 ~ 20mA and 4 ~ 20mA), analog outputs are 12 bit with +/-5V, +/-10V, 0 ~ 20mA and 4 ~ 20mA and digital output can be set alarm output. Each analog input is allowed to configure an individual range and has 240Vrms high over voltage protection. Jumper selectable for voltage or current inputs/outputs.

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The features of the PET-7000 differ from the ET-7000

Power over Ethernet + ET-7000 = PET-7000

PET-7000 features “PoE” and many other advantages in ET-7000. Now, not only data but power is carried through an Ethernet cable. This feature makes installation of PET-7000 a piece of cake. Imagine that no more unnecessary wires, only an Ethernet cable takes care of everything in the field.

PET-7000 also features a built-in web server and the web HMI function. A built-in web server allows basic setting configuration, I/O monitoring and I/O control by simply using a regular web browser. Remote control is as easy as you surf the internet.

As to the web HMI function, no programming or HTML skills are required; creating dynamic and attractive web pages for I/O monitoring and I/O control would be fun for engineers ever after.

PET-7000 also supports Modbus/TCP protocol that makes perfect integration for PET-7000 to SCADA software.

Industrial PoE Solution

When using PoE devices like PET-7000, you can choose ICP DAS “PoE” switch —”NS-205PSE” as the power source, NS-205PSE automatically detects the connected devices whether they are PoE devices or not. This mechanism ensures NS-205PSE to work with both PoE and non-PoE devices coordinately at the same time.

Being as a power source for PoE devices, NS-205PSE requires its power input ranging from +46 ~ +55VDC.

More information about PET-7000

There are two ways for PET-7000 getting the power. One is through Ethernet by a PoE switch; the other is as usual through wiring by an external power. External power should range from +12 ~ 48 VDC. The reason we keep the second way is because it might be useful if someday or somehow you have different applications.

There is a LED on PET-7000. The LED indicates whether the power comes from the PoE switch or not.

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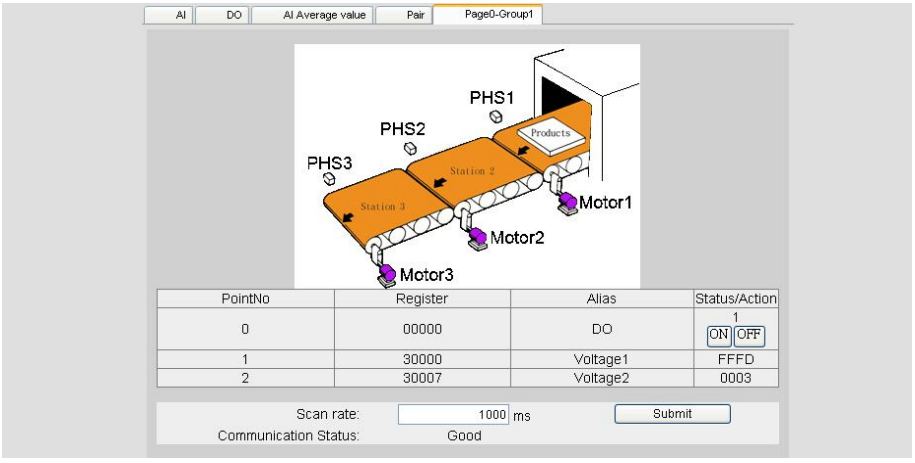
1.1. Features

Built in Web Server

Each ET-7000/PET-7000 module has a built-in web server that allows users to easily configure, monitor and control the module from a remote location using a regular web browser.

Web HMI

The Web HMI function allows the users to create dynamic and attractive web pages to monitor and control the I/O points. Users can upload specific I/O layout pictures (bmp, jpg, gif format) and define a description for each I/O point. No HTML or Java skills are needed to create the web pages.



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Communication Security

Account and password are needed when logging into the ET-7000/PET-7000 web server. An IP address filter is also included, which can be used to allow or deny connections with specific IP addresses.

Modbus Protocol

The Modbus/TCP slave function on the Ethernet port can be used to provide data to remote SCADA software.

Built-in Multi-function I/O

All Digital Output modules provide:
Power on value (On boot up, the status of DO module is set to the Power-on value)
Safe value (If Modbus/TCP communication is lost for a certain period, the DO status will be set to the user defined safe value)
All Digital Input modules provide:
High/Low latched status
DI channels can also be used as DI status and 32-bit low speed (500Hz) counters.

All-in-one Module

Various I/O components are mixed with multiple channels in a single module, which provides the most cost effective I/O usage and enhances performance of the I/O operations

2-way Isolated Noise/Surge Protection

To protect the hardware from damage caused by noise and surge, ET-7000/PET-7000 module is designed with isolation circuits for Ethernet, and I/O.

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Built-in Dual Watchdog

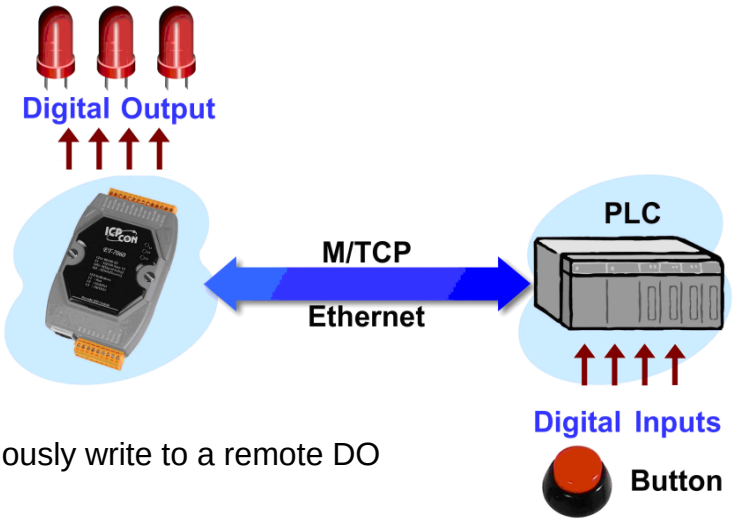
The Dual Watchdog consists of a Module Watchdog and a Host Watchdog. Module Watchdog is a built-in hardware circuit that can be used to monitor the operation of the module and will reset the CPU module if a failure occurs in the hardware or the software.
Host Watchdog is a software function that can be used to monitor the operating status of the host, and is used to prevent network communication problems or host failures.

Automatic MDI / MDI-X Crossover for Plug-and-play

RJ-45 port supports automatic MDI/MDI-x that can automatically detect the type of connection to the Ethernet device without requiring special straight or crossover cables.

I/O Pair Connection

This function is used to create a DI to DO pair through the Ethernet. Once the configuration is completed, ET-7000/PET-7000 module can poll the status of local DI channels and then use the Modbus/TCP protocol to continuously write to a remote DO device in the background.



Ventilated Housing Designed to Operate Between -25°C to +75°C

ET-7000/PET-7000 is housed in a plastic-based shell/case with a column-like ventilator that helps to cool the working environment inside the shell/case and allows ET-7000/PET-7000 to operate at temperatures ranging from -25°C to +75°C.

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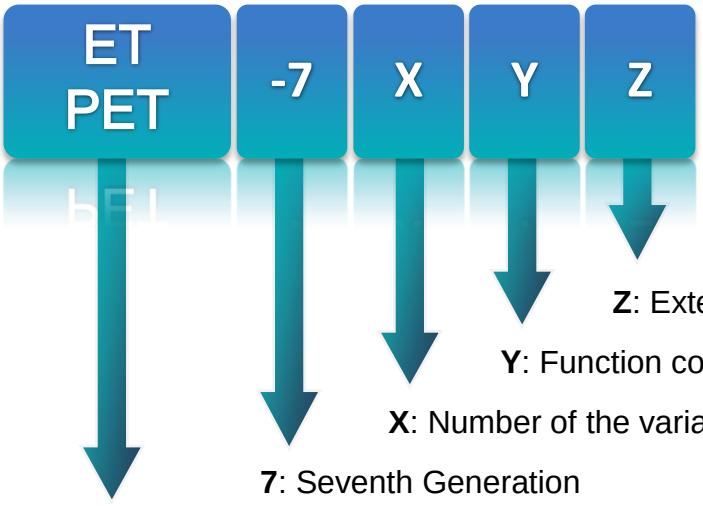
1.2. Module Selection

1.2.1. Part Naming Convention

As you examine this manual, you'll notice there are many different products available.



Z: Extension function code

Y: Function code

X: Number of the variance

7: Seventh Generation

ET: Ethernet communication interface without PoE

PET: Ethernet communication interface with PoE

X	Y	Z
Number of variance	1. AI module	4. Transmitter 5. RTD 6. Strain Gauge 7. Analog Input 8. Thermocouple
	2. AO module	1. Voltage output 2. Current output
	3. Reserved	
	4. DIO module	Number of variance
	5. DIO module	Number of variance
	6. DIO module with relay	Number of variance
	7. Multi-function	1. General purpose
	8. Counter/Frequency	Number of variance
	9. Motion	N: Number of axes

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1.2.2. Released Module

Either ET-7000 or PET-7000 has released three different types of analog series modules, which provides a variety of analog module choice, listed in the following table.

Type	Model	Description
RTD	ET-7015/ PET-7015	7-channel RTD Inputs with 3-wire RTD lead resistance elimination
Voltage and Current	ET-7017/ PET-7017	4-channel isolated digital outputs and 8-channel differential analog inputs
	ET-7017-10	10-channel differential analog inputs or 20-channel single-ended analog inputs
Thermocouple	ET-7018Z/ PET-7018Z	10-channel Thermocouple inputs and 6-channel isolated digital outputs

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1.3. Specifications

1.3.1. System Specifications

System	
CPU	80186 CPU (80 MHz)
SRAM	512 KB
Flash Memory	512 KB
EEPROM	16 KB
Dual Watchdog	Yes
Communication	
Ethernet Port	10/100 Base-TX (With Link, Activity LED Indicator) Automatic MDI/MDI-X
2-Way Isolation	
Ethernet	1500 V_{DC}
AI and DO	2500 V_{DC}
LED Display	
L1	Run indicator
L2	Link/Act indicator
L3	10/100M indicator
Power Requirements	
Protection	Power reverse polarity protection
Required Supply Voltage	+10 V_{DC} ~ +30 V_{DC} (non-regulated)
Power Consumption	Depending on the type of ET-7000/PET-7000 module (For more details, please refer to section 1.3.2. I/O Specifications)
Mechanical	
Dimensions (W x H x D)	123 mm x 72 mm x 35 mm
Installation	DIN Rail or Wall mounting
Environment	
Operating Temperature	-25 ˚C ~ +75 ˚C
Storage Temperature	-30 ˚C ~ +80 ˚C
Humidity	5 ~ 90 % RH, non-condensing

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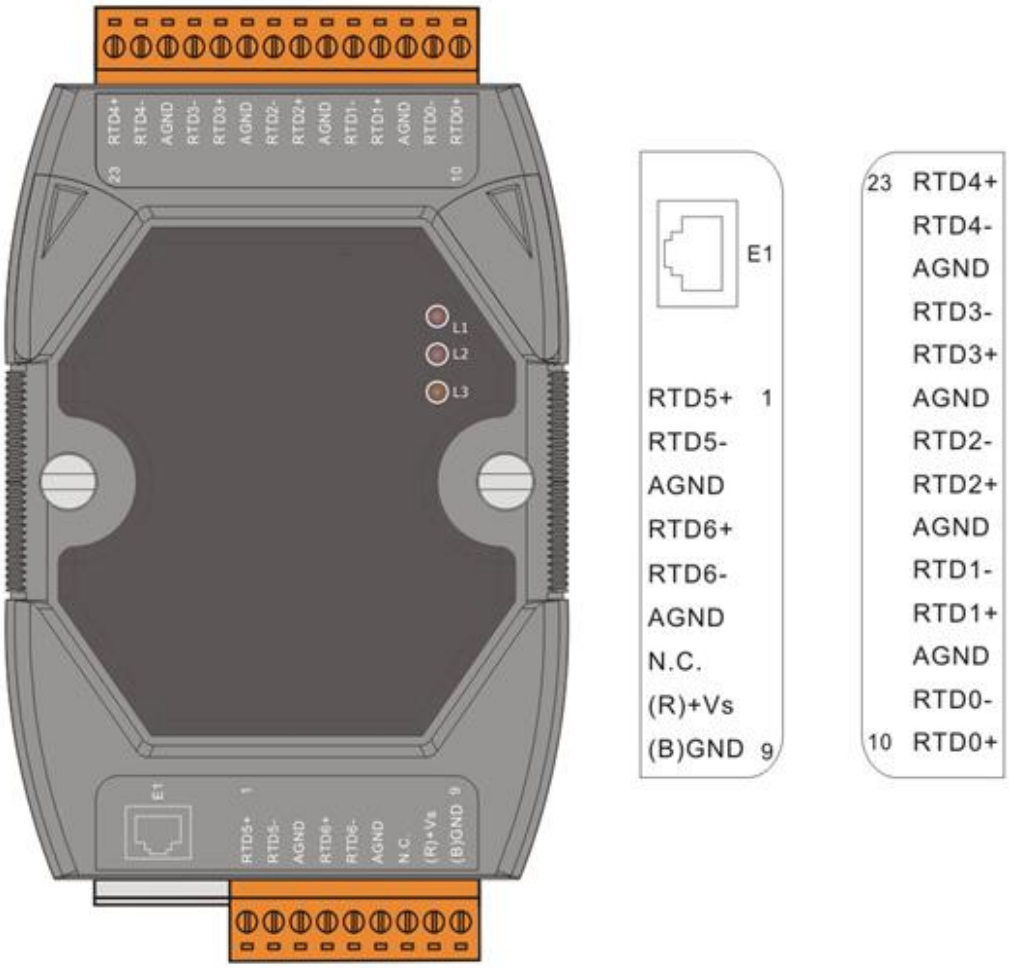
1.3.2. I/O Specifications

1.3.2.1. ET-7015/PET-7015



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Analog Input	
Input Channels	7 (Differential)
Input Type	RTD
Wire Connection	2/3 wire
RTD Type	Pt100, Pt1000, Ni120, Cu100, Cu1000
Resolution	16-bit
Sampling Rate	12 Samples/second (Total)
Accuracy	+/- 0.05 %
-3dB Bandwidth	15.7 Hz
Zero drift	+/- 0.5 μV/°C
Span drift	+/- 20 μV/°C
Voltage Input Impedance	> 1 MOhm
Common Mode Rejection	150 dB
Normal Mode Rejection	100 dB
Open Wire Detection	Yes
Individual Channel Configurable	Yes
3-wire RTD lead resistance elimination	Yes
ESD Protection	4 kV Contact for each terminal, and 8 kV Air for random point
EFT Protection	4 kV for Power

Power Requirements	
Power Consumption	0.1 A/24 V_{DC} Max. (non-regulated)

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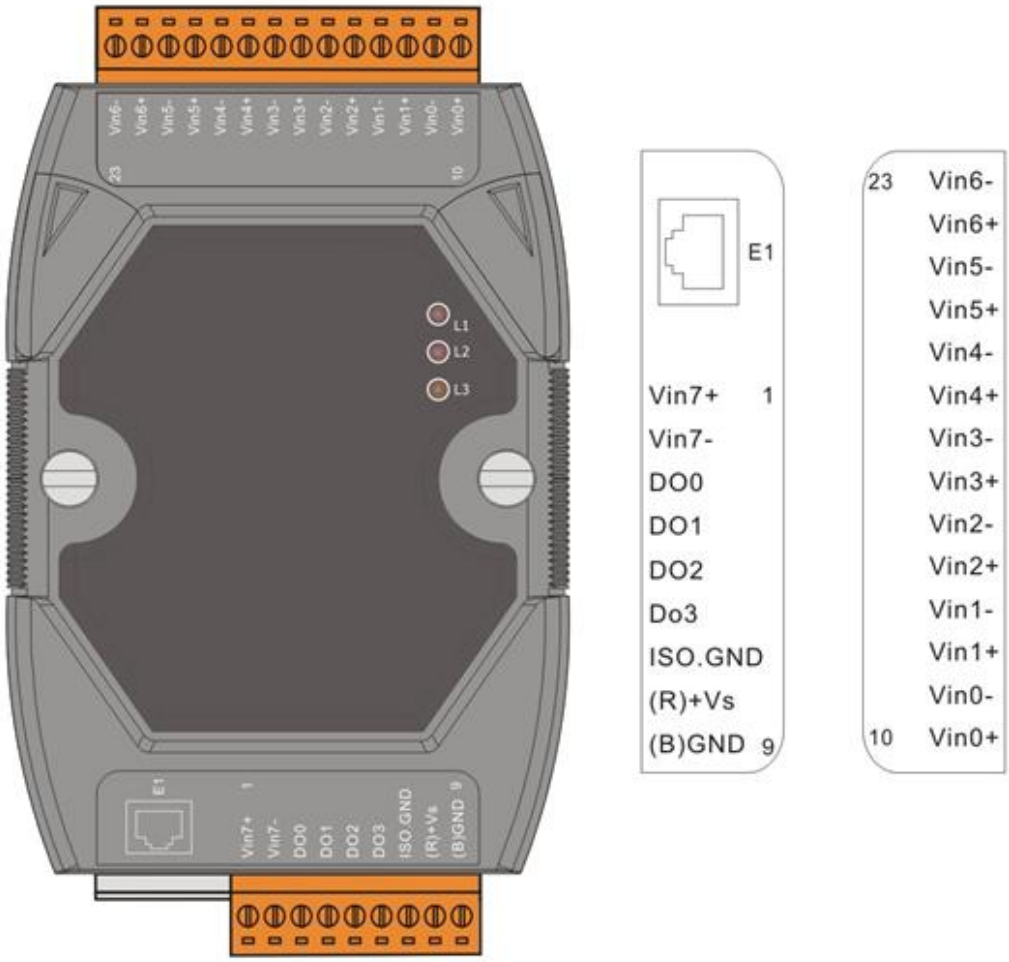
1.3.2.2. ET-7017/PET-7017



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Analog Input	
Input Channels	8 (Differential)
Input Type	+/- 150 mV, +/- 500 mV, +/- 1 V, +/- 5V, +/- 10 V +/- 20 mA, 0 ~ 20 mA, 4 ~ 20 mA (jumper selectable)
Resolution	16-bit (Normal Mode) /12-bit (Fast Mode)
Sampling Rate	10 Samples/second total (Normal Mode) /50 Samples/ second total (Fast Mode)
Accuracy	+/- 0.1 % (Normal Mode)/ +/- 0.5 % (Fast Mode) or better
Bandwidth	15.7 Hz (Normal Mode) /78.7 Hz (Fast Mode)
Zero drift	+/- 20 μV/°C
Span drift	+/- 25 μV/°C
Input Impedance	Voltage: 2 MOhm Current: 125 Ohm
Common Mode Rejection	86 dB min
Normal Mode Rejection	100 dB
Over Voltage Protection	240 Vrms
ESD Protection	4 kV Contact for each terminal, and 8 kV Air for random point
EFT Protection	4 kV for Power

Digital Output	
Output Channels	4 (Sink)
Output Type	Isolated Open Collector
Max Load Current	700 mA/channel
Load Voltage	5 ~ 50 V_{DC}

Power Requirements	
Power Consumption	0.10 A/24 V_{DC} Max.

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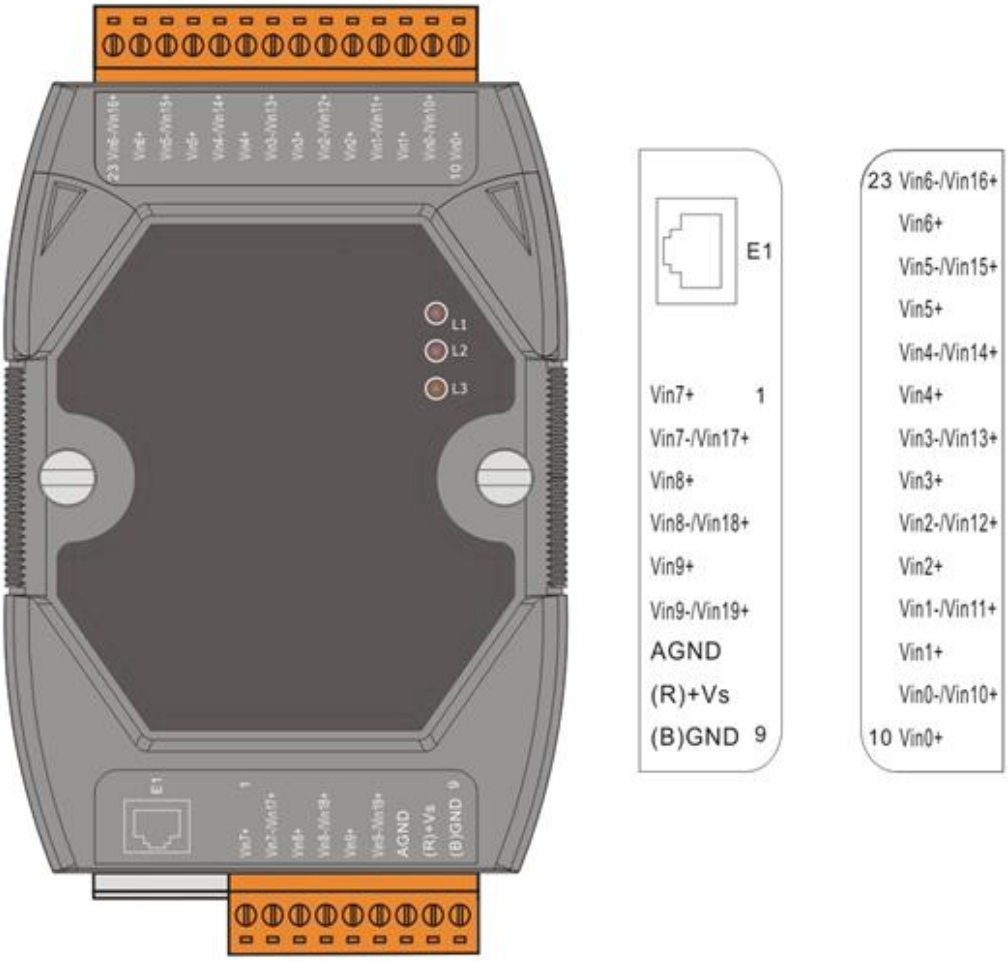
1.3.2.3. ET-7017-10



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Analog Input	
Input Channels	10 differential or 20 single-ended (Note 1), software selectable
Input Type	+/- 150 mV, +/- 500 mV, +/- 1 V, +/- 5 V, +/- 10 V +/- 20 mA, 0 ~ 20 mA, 4 ~ 20 mA (jumper selectable)
Resolution	16-bit (Normal Mode) /12=bit (Fast Mode)
Sampling Rate	10 Samples/second total (Normal Mode) /50 Samples/ second total (Fast Mode)
Accuracy	+/- 0.1 % (Normal Mode)/ +/- 0.5 % (Fast Mode) or better
Bandwidth	15.7 Hz (Normal Mode) /78.7 Hz (Fast Mode)
Zero drift	+/- 20 μV/°C
Span drift	+/- 25 μV/°C
Input Impedance	Voltage: 2 MOhm (Differential), 1 MOhm (Single-ended) Current: 125 Ohm
Common Mode Rejection	86 dB min.
Normal Mode Rejection	100 dB
Over Voltage Protection	Differential: 240 Vrms, Single-ended: 150 Vrms
ESD Protection	4 kV Contact for each terminal, and 8 kV Air for random point
EFT Protection	4 kV for Power

Power Requirements	
Power Consumption	0.11 A/24 V_{DC} Max. (non-regulated)

Note 1: Single-Ended Mode is not available to current inputs.

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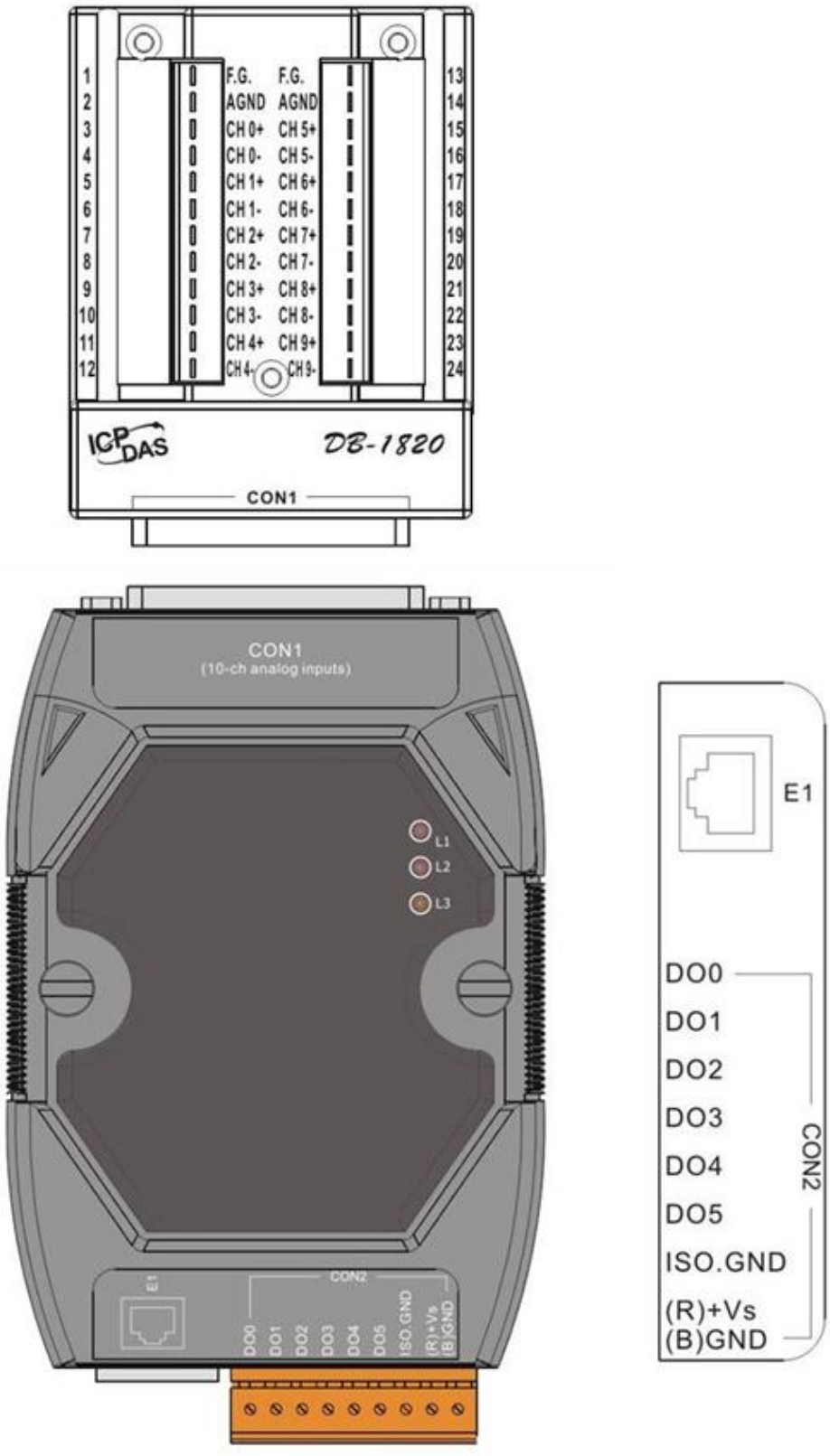
1.3.2.4. ET-7018Z/PET-7018Z



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Analog Input	
Input Channels	10 (Differential)
Input Type	+/- 15 mV, +/- 50 mV, +/- 100 mV, +/- 500 mV, +/- 1 V, +/- 2.5 V +/- 20 mA, 0 ~ 20 mA, 4 ~ 20 mA (Requires Optional External 125 Ohm Resistor) Thermocouple (J, K, T, E, R, S, B, N, C, L, M, LDIN43710)
Resolution	16-bit
Sampling Rate	10 Samples/second total
Accuracy	+/- 0.1 % or better
-3dB Bandwidth	15.7 Hz
Zero drift	+/- 0.5 μV/°C
Span drift	+/- 25 ppm/°C
Input Impedance	>300 Ohm
Common Mode Rejection	150 dB min
Normal Mode Rejection	100 dB
Open Wire Detection	Yes
Individual Channel Configurable	Yes
Over Voltage Protection	240 Vrms
ESD Protection	4 kV Contact for each terminal, and 8 kV Air for random point
EFT Protection	4 kV for Power

Digital Output	
Output Channels	6 (Sink)
Output Type	Isolated Open Collector
Max Load Current	700 mA/channel
Load Voltage	5 ~ 50 V_{DC}

DB-1820	
Wire Strip Length	4 ~ 5 mm
Wire Range	16 ~ 24 AWG

Power Requirements	
Power Consumption	0.09 A/24 V_{DC} Max. (non-regulated)

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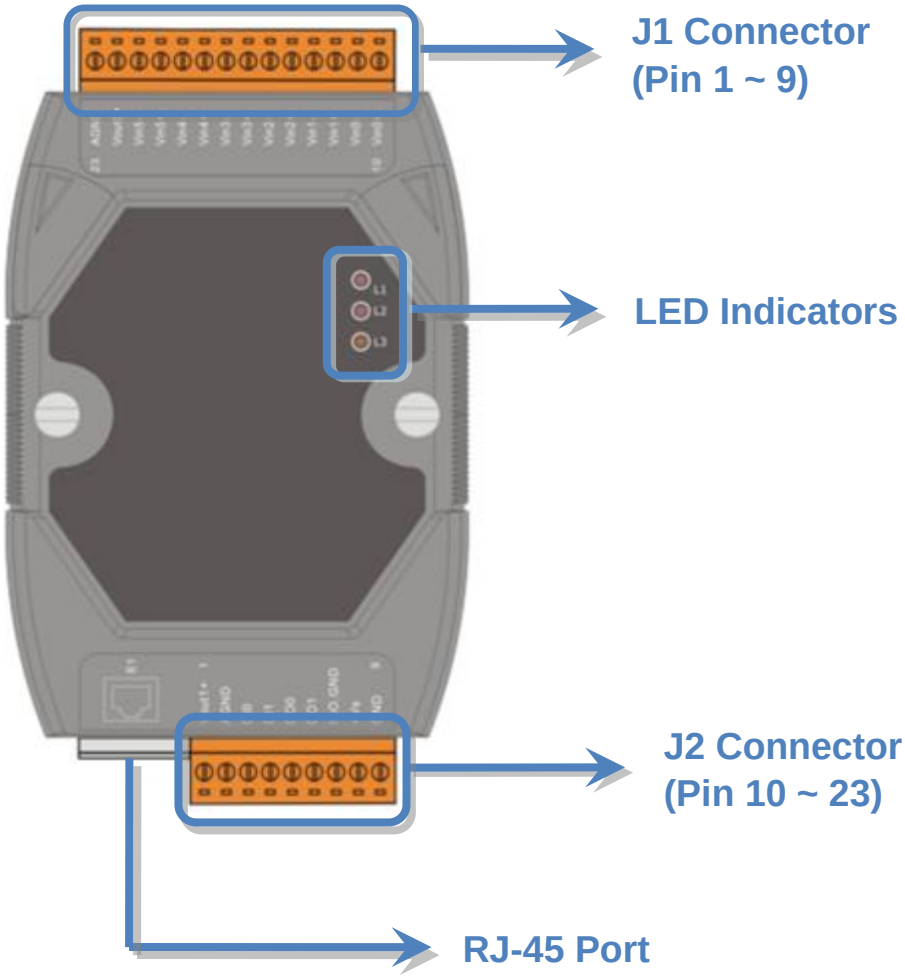
1.4. Overview

1.4.1. Front Panel

The ET-7000/PET-7000 front panel contains the Ethernet port, connectors and LEDs.



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LED Indicators

Name	LED Action	Function
Run	Flashing	Firmware is running
Link/ACT	ON	Ethernet link detected
	OFF	No Ethernet link detected
	Flashing Green	Ethernet packet received
10/100M	OFF	Speed 10 Mbps
	Orange	Speed 100 Mbps

Tips & Warnings

If the Run LED does not display the information as above, the following steps should be taken:

Step 1: Switch the power off

Step 2: Check that the Init/Normal switch is in the Normal position (Refer to 1.4.2. Back Panel)

Step 3: Switch the power on and double-check the LED indicators

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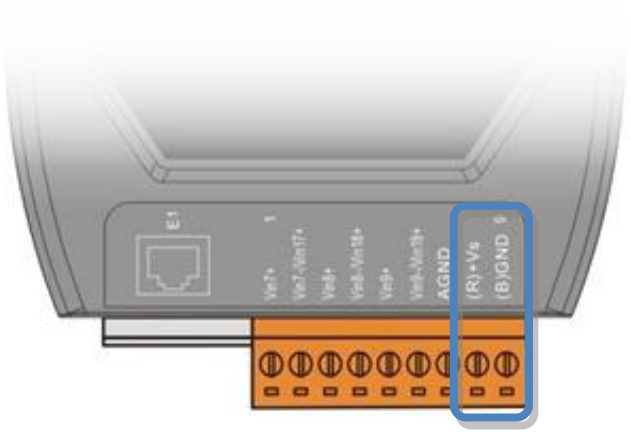
J1 Connector

Refer to 1.3.2. I/O Specifications for more details regarding the pin assignments of the J1 Connector for all types of ET-7000/PET-7000 series modules.

J2 Connector



The definition of pin 8 and pin 0 applies to all types of the ET-7000/PET-7000 modules. The definition of the other pins is dependent on the particular ET-7000/PET-7000 modules.

Pin number	Name	Function
8	+VS	10 ~ 30 VDC power input
9	GND	Ground connection

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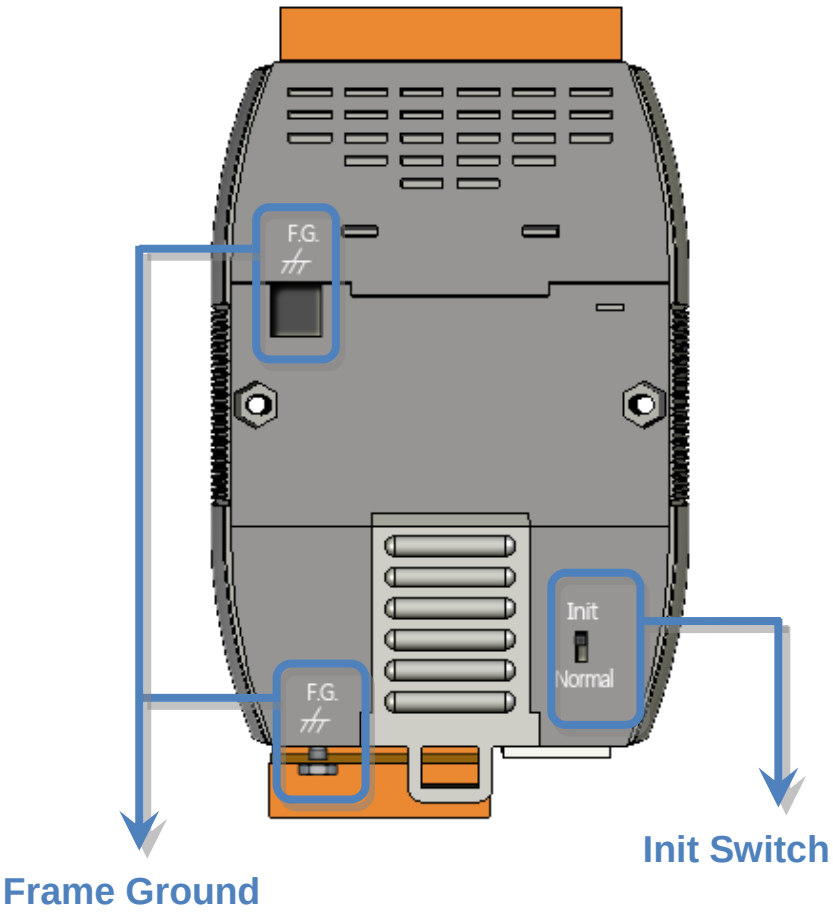
1.4.2. Back Panel

The ET-7000/PET-7000 back panel contains the frame ground and



Init/Normal Switch

Init mode: MiniOS7 configuration mode
Normal mode: Firmware running mode

In the ET-7000/PET-7000 series, the Switch is ALWAYS in the Normal position. Only when updating the ET-7000/PET-7000 firmware or OS, the switch can be moved from the Normal position to the Init position.

Move the Switch to the Normal position after the update is complete.

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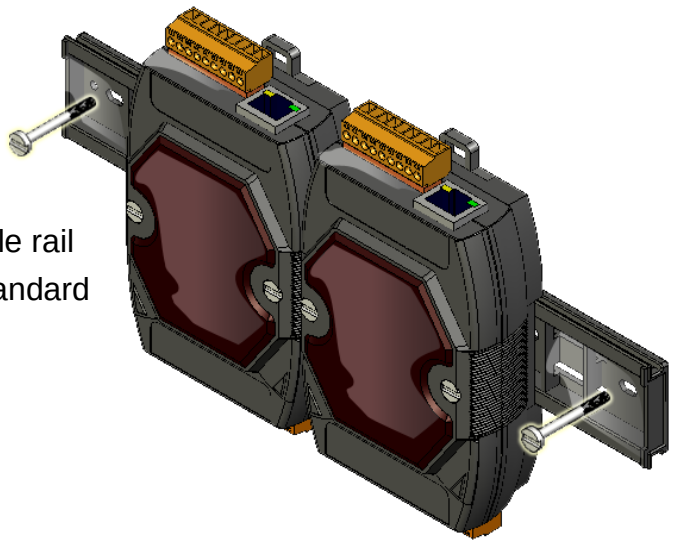
1.5. Installation

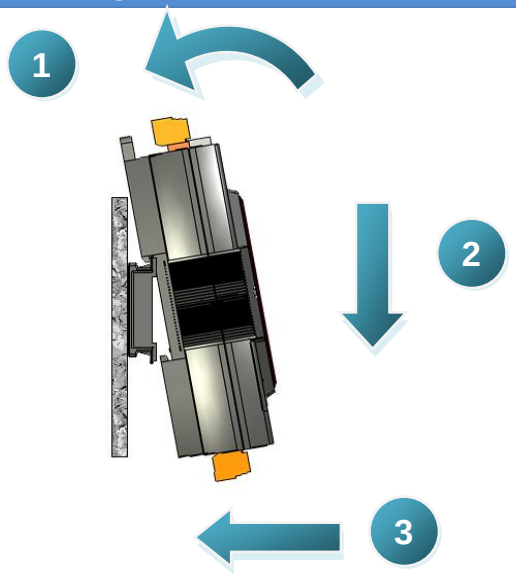
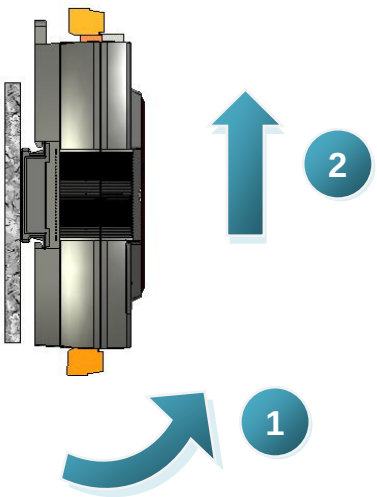
1.5.1. Mounting the ET-7000/PET-7000

The ET-7000/PET-7000 can be mounted with the bottom of the chassis on the DIN rail, the wall or piggyback.



DIN Rail mounting

The ET-7000/PET-7000 has simple rail clips for mounting reliably on a standard 35 mm DIN rail.

Mounting on DIN Rail	Remounting from DIN Rail
	

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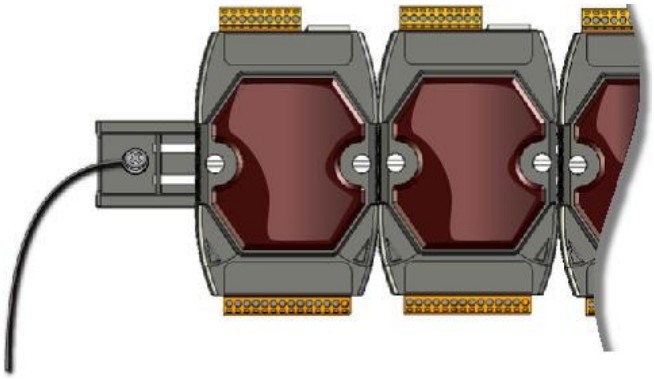
Din Rail Mountable Model

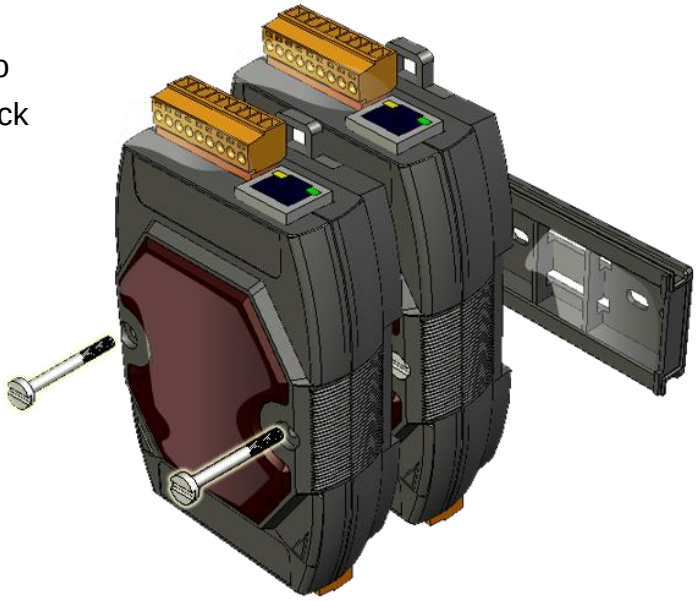
Three Din rail mountable models are available to mount a variety of ICP DAS devices. Each is made of stainless steel and has a ground wire at the end.



Part number	Maximum number of modules	Dimensions
DRS-125	2	125 mm x 35 mm
DRS-240	3	240 mm x 35 mm
DRS-360	5	360 mm x 35 mm

Piggyback Mounting

The ET-7000/PET-7000 has two holes on both sides for piggyback mounting



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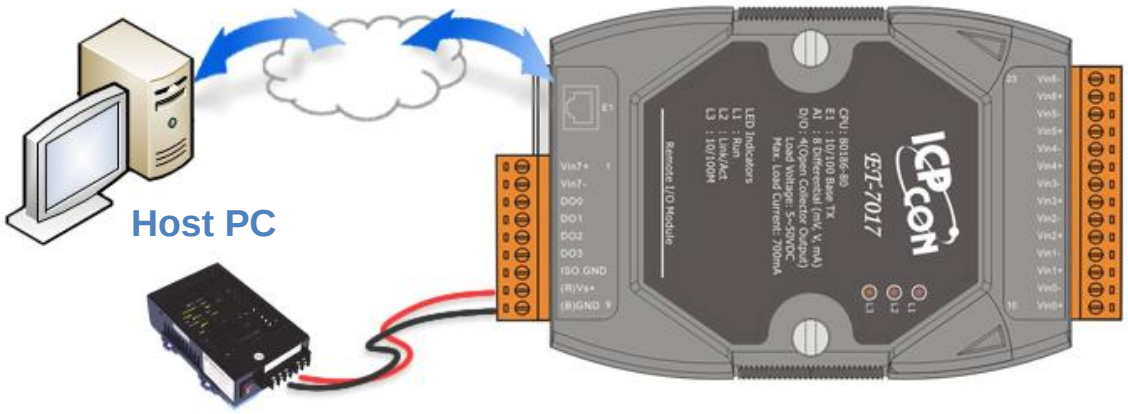
1.5.2. Connecting the hardware

Step 1: Connect the Ethernet cable between the ET-7000/PET-7000 and the Host PC. Please refer to the Ethernet cable wiring section at the next page.

Step 2: Apply the power (+Vs, GND) in a range from 10 to 30 VDC to the ET-7000/PET-7000.



Step 3: Check that the “RUN” LED (L1) on the ET-7000/PET-7000 is periodically ON for 0.5 seconds and then OFF for 0.5 seconds.

Tips & Warnings

In ET-7000/PET-7000 series modules, V+ is connected to Pin 8 of the J2 connector, and GND is connected to Pin 9 of the J2 connector.

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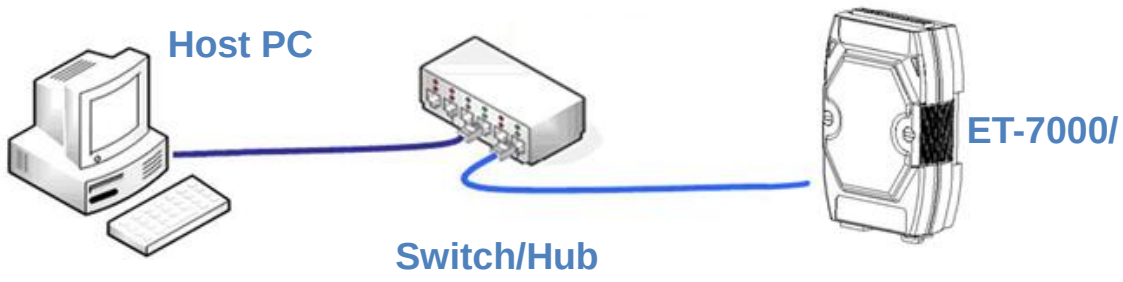
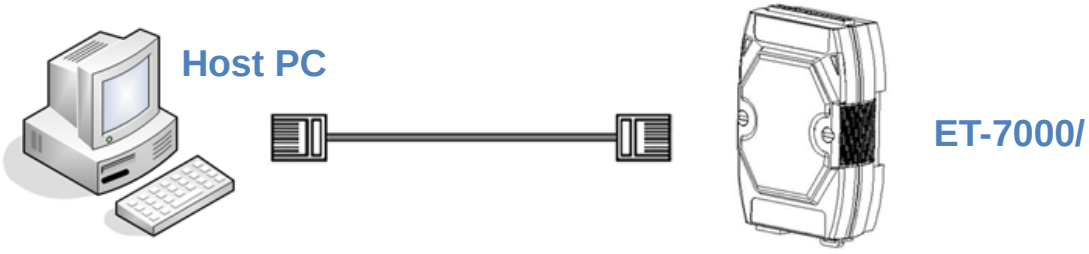
1.5.3. Ethernet cable wiring

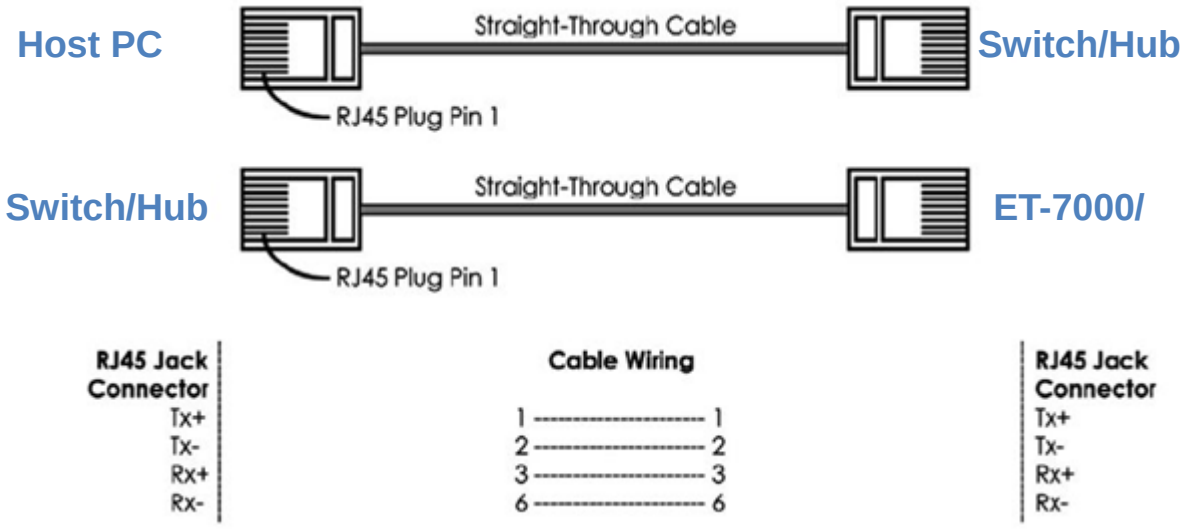
Connecting the ET-7000/PET-7000 to Switch or Hub



Connecting the ET-7000/PET-7000 to a Host PC



As a result of the automatic MDI/MDI-X crossover for plug-and-play on the ET-7000/PET-7000 RJ45 port, there is no need to a crossover cable to connect the ET-7000/PET-7000 to the Host PC, and only a general straight-through cable is needed to make the connection. The straight-through cable is shown as follows:



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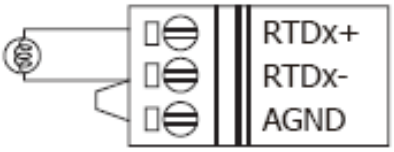
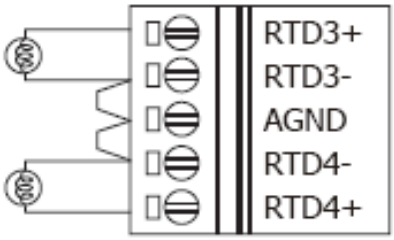
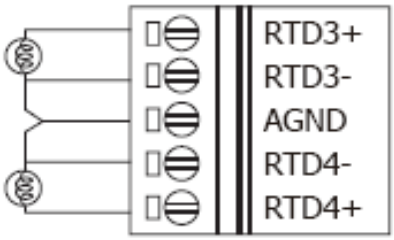
1.6. I/O wiring connection

1.6.1. ET-7015/PET-7015

	CH0, 1, 2, 5 and 6	CH3 and CH4
2-Wire of RTD		
3-Wire of RTD		

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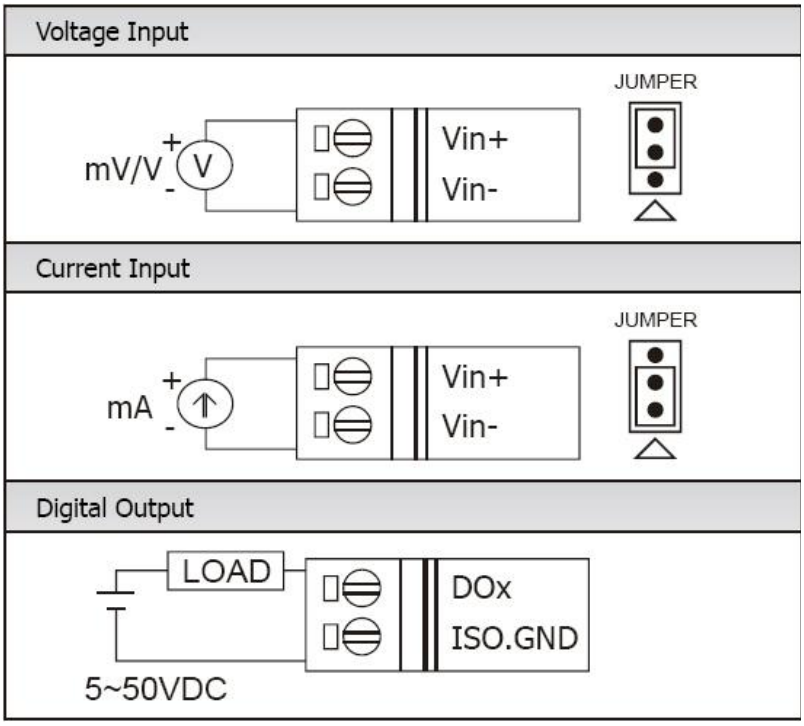
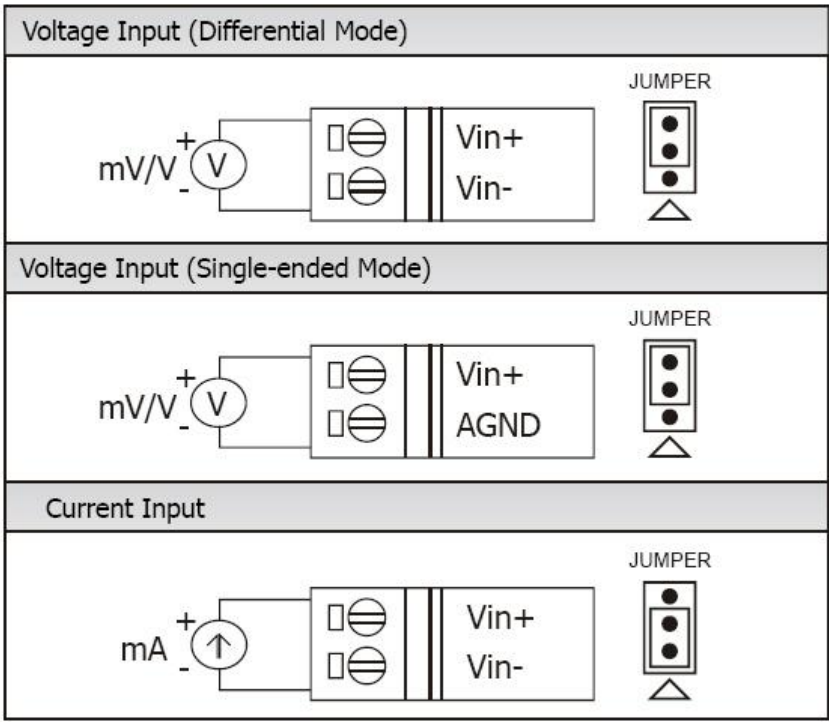
1.6.2. ET-7017/PET-7017



1.6.3. ET-7017-10



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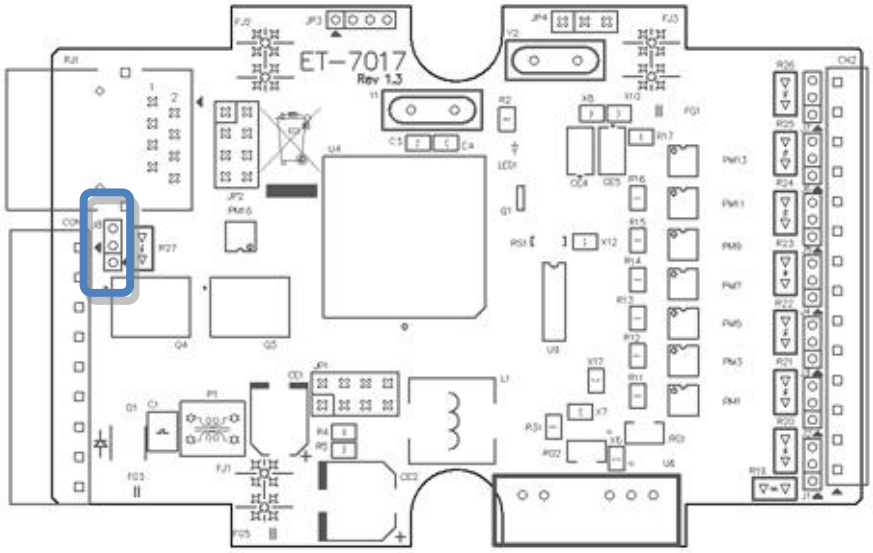
ET-7017, PET-7017 and ET-7017-10 Jumper Settings

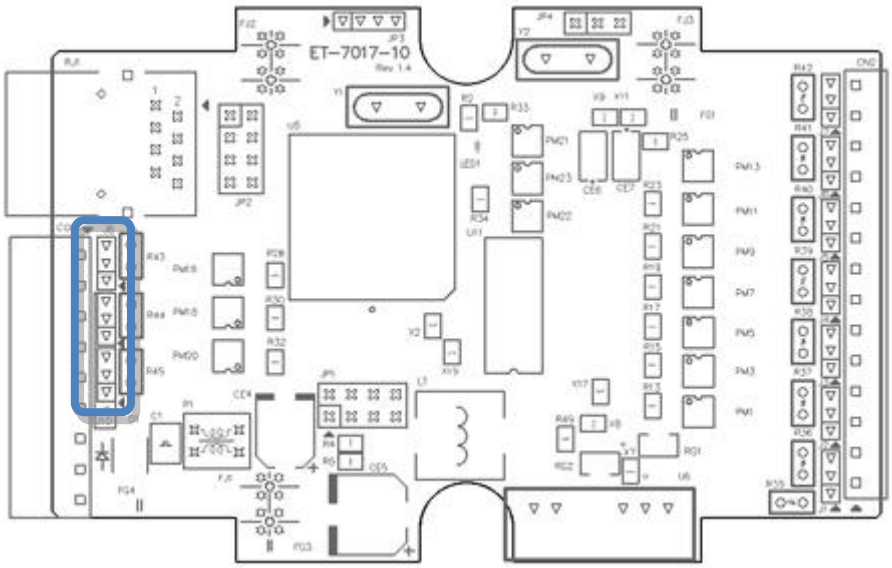
The ET-7017, PET-7017 and ET-7017-10 modules can accept voltage inputs and current inputs. No external resistor required but the corresponding jumper must be shorted.

The position of the jumpers is shown in the figure below.

ET-7017/PET-7017:



ET-7017-10



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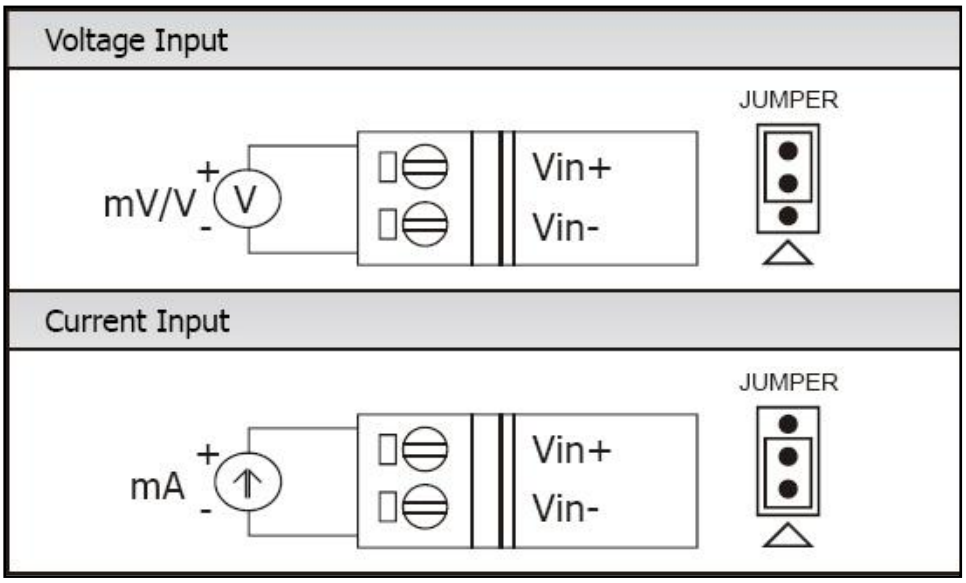
The following figure shows the jumper settings.



Tips & Warnings

To access the jumpers, the cover must be opened

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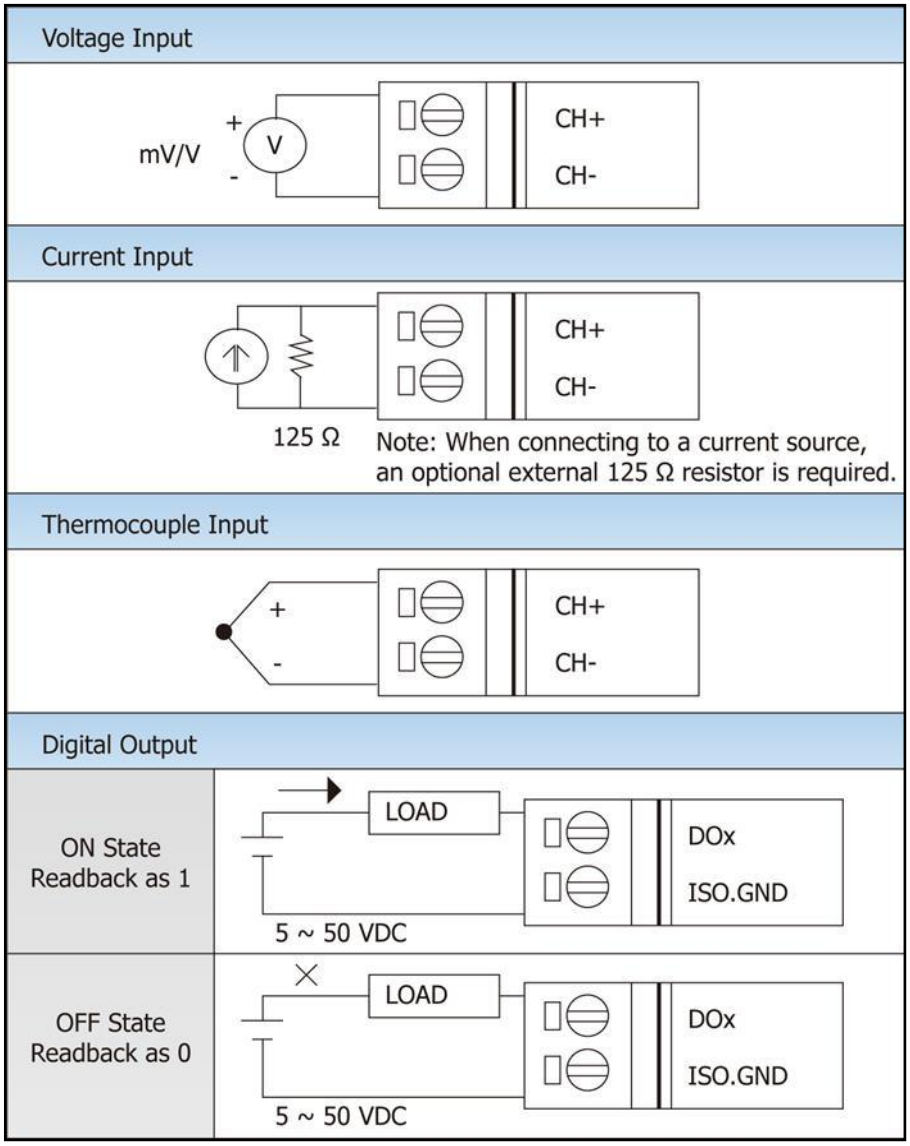
1.6.4. ET-7018Z/PET-7018Z



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1.7. Default Settings

- **ET-7015/PET-7015:**

Module address	01
AI type	Type 20,+/- 100 ℃, Pt 100, α=0.00385
AI data format	Hex format
AI enable	ON
AI temperature offset	0
AI resistance offset	0
Filter setting	60Hz

- **ET-7017/PET-7017** and the **ET-7017-10**:

Module address	01
AI type	Type 08, -10V to 10V
AI data format	Hex format
Filter setting	60Hz
Input mode	Normal mode

- **ET-7018Z/PET-7018Z**:

Module address	01
AI type	Type 05, -2.5V to 2.5V
AI data format	Hex format
Filter setting	60Hz
Input mode	Normal mode

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1.8. Calibration and Adjustment

It is not recommended that calibration be performed until the process is fully understood.

1.8.1. ET-7015/PET-7015

For the ET-7015/PET-7015, each channel should be calibrated separately and only the channel being calibrated should be enabled during calibration.

1. Warm up the module for at least 30 minutes.
2. Enable the channel you want to calibrate and disable other channels.
3. Set the type code to the type you wish to calibrate.
4. Enable calibration
5. Connect the zero calibration resistors to the enabled channel.
6. Send zero calibration command.
7. Connect the span calibration resistor to the enabled channel
8. Send the span calibration command.
9. Disable calibration

- **Modbus address for calibration**

Register	Points	Description	Access Type
00830	1	Enable/Disable Calibration 0=Disabled 1=Enabled	R/W
00831	1	Zero calibration command of ch0, 1 = run.	W (Pulse)
00832	1	Span calibration command of ch0, 1 = run	W (Pulse)
00833	1	Zero calibration command of ch1, 1 = run.	W (Pulse)
00834	1	Span calibration command of ch1, 1 = run	W (Pulse)
00835	1	Zero calibration command of ch2, 1 = run.	W (Pulse)
00836	1	Span calibration command of ch2, 1 = run	W (Pulse)
00837	1	Zero calibration command of ch3, 1 = run.	W (Pulse)

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00838	1	Span calibration command of ch3, 1 = run	W (Pulse)
00839	1	Zero calibration command of ch4, 1 = run.	W (Pulse)
00840	1	Span calibration command of ch4, 1 = run	W (Pulse)
00841	1	Zero calibration command of ch5, 1 = run.	W (Pulse)
00842	1	Span calibration command of ch5, 1 = run	W (Pulse)
00843	1	Zero calibration command of ch6, 1 = run.	W (Pulse)
00844	1	Span calibration command of ch6, 1 = run	W (Pulse)

- **Calibration resistors for the ET-7015/PET-7015**

Type code	Zero Calibration Resistor	Span Calibration Resistor
2B	0 Ohm	200 Ohm
20	0 Ohm	375 Ohm
2A	0 Ohm	3200 Ohm

- **Note**

1. Types 21 to 29, 2E, 2F, 80 81 and 83 use the same calibration parameters as type 20.
2. Type 2C and 82 uses the same calibration parameters as type 2B.
3. Type 2D uses the same calibration parameters as type 2A.

- **RTD Input Type**

Type Code	RTD Input Type	Temperature Range °C
20	Platinum 100, α= 0.00385	-100 ~ 100
21	Platinum 100, α= 0.00385	0 ~ 100
22	Platinum 100, α= 0.00385	0 ~ 200
23	Platinum 100, α= 0.00385	0 ~ 600
24	Platinum 100, α= 0.003916	-100 ~ 100
25	Platinum 100, α= 0.003916	0 ~ 100
26	Platinum 100, α= 0.003916	0 ~ 200
27	Platinum 100, α= 0.003916	0 ~ 600
28	Nickel 120	-80 ~ 100
29	Nickel 120	0 ~ 100

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2A	Platinum 1000, α= 0.00385	-200 ~ 600
2B	Cu 100 @ 0°C,α= 0.00421	-20 ~ 150
2C	Cu 100 @ 25°C,α= 0.00427	0 ~ 200
2D	Cu 1000 @ 0°C,α= 0.00421	-20 ~ 150
2E	Platinum 100, α= 0.00385	-200 ~ 200
2F	Platinum 100, α= 0.003916	-200 ~ 200
80	Platinum 100, α= 0.00385	-200 ~ 600
81	Platinum 100, α= 0.003916	-200 ~ 600
82	Cu 50 @ 0°C	-50 ~ 150
83	Nickel 100	-60 ~ 180

- **RTD Input Type and Data Format**

Type Code	RTD Type	Data Format	+F.S	-F.S
20	Platinum 100 α= 0.00385 -100 ~ 100°C	Engineering unit	+10000	-10000
		2's comp HEX	7FFF	8000
		Ohm	+138.50	+060.60
21	Platinum 100 α= 0.00385 0 ~ 100°C	Engineering unit	+10000	+00000
		2's comp HEX	7FFF	0000
		Ohm	+138.50	+100.00
22	Platinum 100 α= 0.00385 0 ~ 200°C	Engineering unit	+20000	+00000
		2's comp HEX	7FFF	0000
		Ohm	+175.84	+100.00
23	Platinum 100 α= 0.00385 0 ~ 600°C	Engineering unit	+60000	+00000
		2's comp HEX	7FFF	0000
		Ohm	+313.59	+100.00
24	Platinum 100 α= 0.003916 -100 ~ 100°C	Engineering unit	+10000	-10000
		2's comp HEX	7FFF	8000
		Ohm	+139.16	+060.60
25	Platinum 100 α= 0.003916	Engineering unit	+10000	+00000

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	0 ~ 100°C	2's comp HEX	7FFF	0000
		Ohm	+139.16	+100.00
26	Platinum 100 α= 0.003916 0 ~ 200°C	Engineering unit	+20000	+00000
		2's comp HEX	7FFF	0000
		Ohm	+177.14	+100.00
27	Platinum 100 α= 0.003916 0 ~ 600°C	Engineering unit	+60000	+00000
		2's comp HEX	7FFF	0000
		Ohm	+317.28	+100.00
28	Nickel 120 -80 ~ 100°C	Engineering unit	+10000	-08000
		2's comp HEX	7FFF	999A
		Ohm	+200.64	+066.60
29	Nickel 120 0 ~ 100°C	Engineering unit	+10000	+00000
		2's comp HEX	7FFF	0000
		Ohm	+20064	+12060
2A	Platinum 1000 α= 0.00385 -200 ~ 600°C	Engineering unit	+600.00	-200.00
		2's comp HEX	7FFF	D556
		Ohm	+3137.1	+0185.2
2B	Cu 100 α= 0.00421 -20 ~ 150°C	Engineering unit	+15000	-02000
		2's comp HEX	7FFF	EEEF
		Ohm	+163.17	+091.56
2C	Cu 100 α= 0.00427 0 ~ 200°C	Engineering unit	+20000	+00000
		2's comp HEX	7FFF	0000
		Ohm	+167.75	+090.34
2D	Cu 1000 α= 0.00421 -20 ~ 150°C	Engineering unit	+15000	-02000
		2's comp HEX	7FFF	EEEF
		Ohm	+1631.7	+0915.6
2E	Platinum 100 α= 0.00385 -200 ~ 200°C	Engineering unit	+20000	-20000
		2's comp HEX	7FFF	8000

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		Ohm	+175.84	+018.49
2F	Platinum 100 α= 0.003916 -200 ~ 200°C	Engineering unit	+20000	-20000
		2's comp HEX	7FFF	8000
		Ohm	+177.14	+017.14
80	Platinum 100 α= 0.00385 -200 ~ 600°C	Engineering unit	+60000	-20000
		2's comp HEX	7FFF	D556
		Ohm	+313.59	+018.49
81	Platinum 100 α= 0.003916 -200 ~ 600°C	Engineering unit	+60000	-20000
		2's comp HEX	7FFF	D556
		Ohm	+317.28	+017.14
82	Cu 50 -50 ~ 150°C	Engineering unit	+15000	-05000
		2's comp HEX	7FFF	D556
		Ohms	+082.13	+039.24
83	Nickel 100 -60 ~ 180°C	Engineering unit	+18000	-06000
		2's comp HEX	7FFF	D556
		Ohms	+223.10	+069.50

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It is not recommended that calibration be performed until the process is fully understood.

1.8.2. ET-7017/PET-7017 and ET-7017-10

1. Warm up the module for at least 30 minutes.
2. Set the type code to the type you want to calibrate.
3. Enable calibration.
4. Apply the zero calibration voltage/current to channel 0.
5. Enable the zero calibration register.
6. Apply the span calibration voltage/current to channels 0.
7. Enable the span calibration register.
8. Disable calibration.

- **Modbus address for calibration**

Register	Points	Description	Access Type
00830	1	Enable/Disable Calibration 0=Disabled 1=Enabled	R/W
00831	1	Performs a zero calibration, 1 = run.	W (Pulse)
00832	1	Performs a span calibration, 1 = run.	W (Pulse)

- **Calibration resistors for the ET-7017/PET-7017 and ET-7017-10**

Type code	08	09	0A	0B	0C	0D
Zero Input	0V	0V	0V	0mV	0mV	0mA
Span Input	+10V	+5V	+1V	+500mV	+150mV	+20mA

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- **Analog Input Type**

Type Code	Analog Input Type	Range
07		4 mA ~ 20 mA
08	+/-10 V	-10 V ~ 10 V
09	+/-5 V	-5 V ~ 5 V
0A	+/-1 V	-1 V ~ 1 V
0B	+/-500 mV	-500 mV ~ 500 mV
0C	+/-150 mV	-150 mV ~ 150 mV
0D	+/-20 mV	-20 mV ~ 20 mV
1A		0 ~ 20 mA

- **Analog Input Type and Data Format**

Type Code	Input Type	Data Format	+F.S	-F.S
07	4mA ~ 20mA	Engineering format	20000	4000
		2's comp HEX	7FFF	8000
08	+/-10V	Engineering format	10000	-10000
		2's comp HEX	7FFF	8000
09	+/-5V	Engineering format	5000	-5000
		2's comp HEX	7FFF	8000
0A	+/-1V	Engineering format	10000	10000
		2's comp HEX	7FFF	8000
0B	+/-500mV	Engineering format	5000	-5000
		2's comp HEX	7FFF	8000
0C	+/-150mV	Engineering format	15000	15000
		2's comp HEX	7FFF	8000
0D	+/-20mV	Engineering format	20000	2000
		2's comp HEX	7FFF	8000
1A	0 ~ 20mA	Engineering format	0	20000
		2's comp HEX	7FFF	8000

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It is not recommended that calibration be performed until the process is fully understood.

1.8.3. ET-7018Z/PET-7018Z

1. Warm up the module for at least 30 minutes.
2. Enable channel 0 and disable the other channels.
3. Set the type code of channel 0 to the type you want to calibrate.
4. Enable calibration.
5. Apply the zero calibration voltage/current to channel 0.
6. Enable the zero calibration register.
7. Apply the span calibration voltage/current to channels 0.
8. Enable the span calibration register.
9. Disable calibration.

- **Modbus address for calibration**

Register	Points	Description	Access Type
00830	1	Enable/Disable Calibration 0=Disabled 1=Enabled	R/W
00831	1	Performs a zero calibration, 1 = run.	W (Pulse)
00832	1	Performs a span calibration, 1 = run.	W (Pulse)

- **Calibration Voltage/current used by the ET-7018Z series**

Type code	00	01	02	03	04	05	06
Zero Input	0mV	0mV	0mV	0mV	0V	0mV	0mA
Span Input	+15mV	+50mV	+100mV	+500mV	+1V	+2.5V	+20mA

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- **Analog Input Type**

Type Code	Analog Input Type	Range
00	+/-15 mV	-15 mV ~ 15 mV
01	+/-50 mV	-50 mV ~ 50 mV
02	+/-100 mV	-100 mV ~ 100 mV
03	+/-500 mV	-500 mV ~ 500 mV
04	+/-1 V	-1 V ~ 1 V
05	+/-2.5 V	-2.5 V ~ 2.5 V
06	+/-20 mV	-20 mV ~ 20 mV
07	+4 to +20 mA	4 mA ~ 20 mA
0E	Type J Thermocouple	-210 °C ~ 760 °C
0F	Type K Thermocouple	-270 °C ~ 1372 °C
10	Type T Thermocouple	-270 °C ~ 400 °C
11	Type E Thermocouple	-270 °C ~ 1000 °C
12	Type R Thermocouple	0 °C ~ 1768 °C
13	Type S Thermocouple	0 °C ~ 1768 °C
14	Type B Thermocouple	0 °C ~ 1820 °C
15	Type N Thermocouple	-270 °C ~ 1300 °C
16	Type C Thermocouple	0 °C ~ 2320 °C
17	Type L Thermocouple	-200 °C ~ 800 °C
18	Type M Thermocouple	-200°C ~ 100°C
19	Type L DIN43710 Thermocouple	-200 °C ~ 900 °C
1A	0 to +20mA	0 mA ~ 20 mA

- **Analog Input Type**

Type Code	Input Type	Data Format	+F.S	-F.S
00	+/-15 mV	Engineering format	15000	-15000
		2's comp HEX	7FFF	8000
01	+/-50 mV	Engineering format	5000	-5000
		2's comp HEX	7FFF	8000
02	+/-100 mV	Engineering format	10000	-10000
		2's comp HEX	7FFF	8000
03	+/-500 mV	Engineering format	5000	-5000

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		2’s comp HEX	7FFF	8000
04	+/-1 V	Engineering format	10000	-10000
		2’s comp HEX	7FFF	8000
05	+/-2.5 V	Engineering format	25000	-25000
		2’s comp HEX	7FFF	8000
06	+/-20mV	Engineering format	20000	-20000
		2’s comp HEX	7FFF	8000
07	4 ~ 20 mV	Engineering format	20000	4000
		2’s comp HEX	7FFF	8000
0E	Type J Thermocouple -210 ~ 760 °C	Engineering format	7600	-2100
		2’s comp HEX	7FFF	DCA2
0F	Type K Thermocouple -270 ~ 1372 °C	Engineering format	13720	-2700
		2’s comp HEX	7FFF	E6D0
10	Type T Thermocouple -270 ~ 400 °C	Engineering format	4000	-2700
		2’s comp HEX	7FFF	A99A
11	Type E Thermocouple -270 ~ 1000 °C	Engineering format	10000	-2700
		2’s comp HEX	7FFF	DD71
12	Type R Thermocouple 0 ~ 1768 °C	Engineering format	17680	0
		2’s comp HEX	7FFF	0
13	Type S Thermocouple 0 ~ 1768°C	Engineering format	17680	0
		2’s comp HEX	7FFF	0
14	Type B Thermocouple 0 ~ 1820°C	Engineering format	18200	0
		2’s comp HEX	7FFF	0
15	Type N Thermocouple -270 ~ 1300 °C	Engineering format	13000	-2700
		2’s comp HEX	7FFF	E56B
16	Type C Thermocouple 0 ~ 2320 °C	Engineering format	23200	0
		2’s comp HEX	7FFF	0
17	Type L Thermocouple -200 ~ 800 °C	Engineering format	8000	-2000
		2’s comp HEX	7FFF	E000
18	Type M Thermocouple -200 ~ 100 °C	Engineering format	1000	-2000
		2’s comp HEX	4000	8000
19	Type L DIN43710 Thermocouple -200 ~ 900 °C	Engineering format	9000	-2000
		2’s comp HEX	7FFF	E38E
1A	0 ~ 20 mA	Engineering format	+20000	0
		2’s comp HEX	FFFF	0

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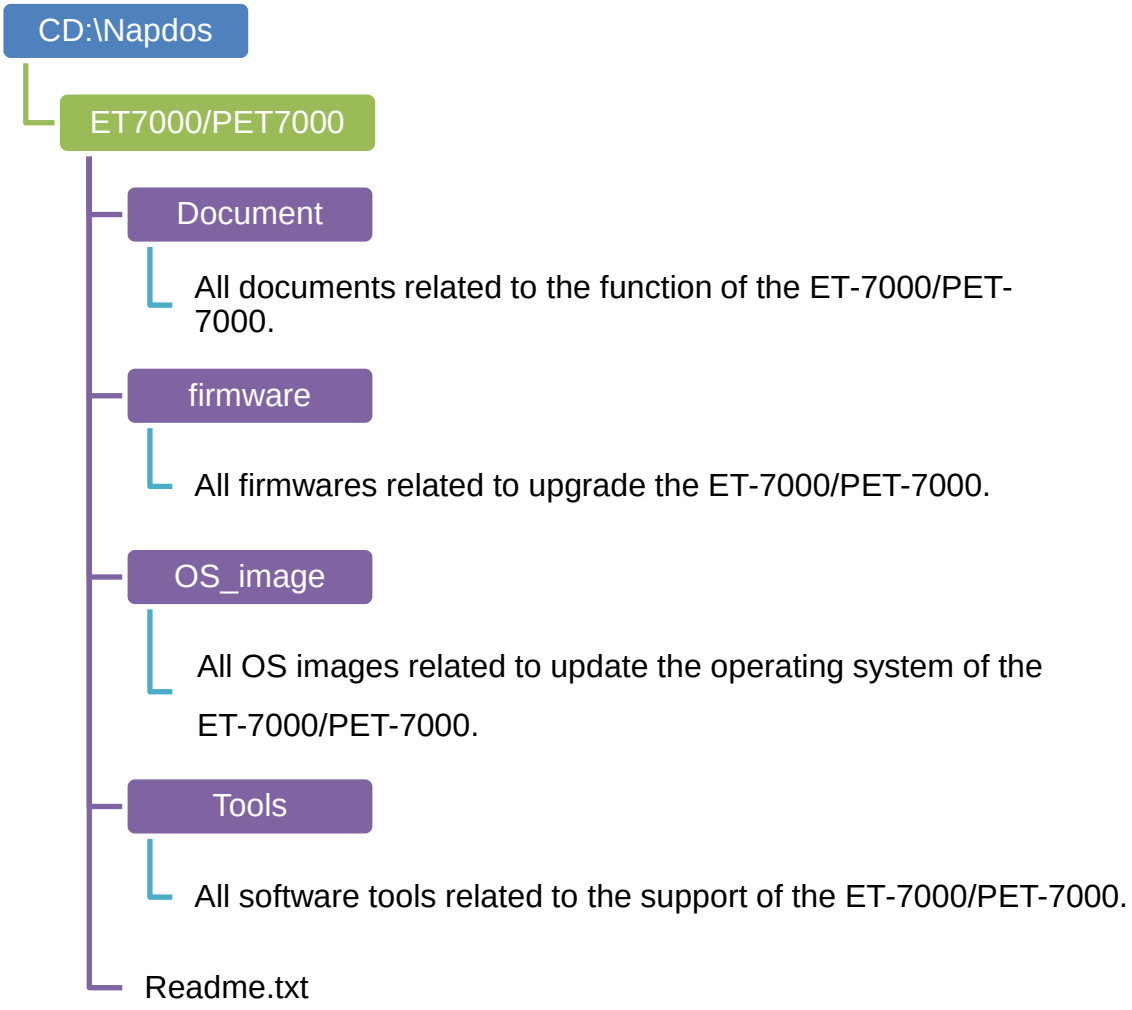
1.9. Companion CD

This package comes with a CD that provides the resource, tool kit, software and documentation related to the ET-7000/PET-7000


CD:\Napdos
ET7000/PET7000
Document
All documents related to the function of the ET-7000/PET-7000.
firmware
All firmwares related to upgrade the ET-7000/PET-7000.
OS_image
All OS images related to update the operating system of the ET-7000/PET-7000.
Tools
All software tools related to the support of the ET-7000/PET-7000.
Readme.txt

1.10. Update Information

Refer to
http://www.icpdas.com/products/Remote_IO/ET-7000/et7k_manual_software.htm

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2. Configuring the ET-7000/PET-7000

Before using the ET-7000/PET-7000, the following settings must be configured:

- **Network settings: IP, Mask, and Gateway of ET-7000/PET-7000**

Item	Default
IP Address	192.168.255.1
Subnet Mask	255.255.0.0
Gateway	192.168.0.1

- **Web page Configuration**

Item	Default
Username	Admin (Case sensitive)
Password	Admin (Case sensitive)

Configuring the Network settings of ET-7000/PET-7000 correct makes it works well.

2.1. Configuring the network settings

To configure the network settings of ET-7000/PET-7000, MiniOS7 utility is used to set the Ethernet addresses via the Ethernet environment.

2.1.1. Using the “MiniOS7 Utility”

The MiniOS7 Utility is used to download files to the ET-7000/PET-7000 module and update the OS image. It is also used to configure the network settings.

Step 1: Refer to Sec. 1.5.2 for details regarding wiring connections for ET-7000/PET-7000 series modules.

Tips & Warnings

The Init/Normal switch is always placed in the Normal position.

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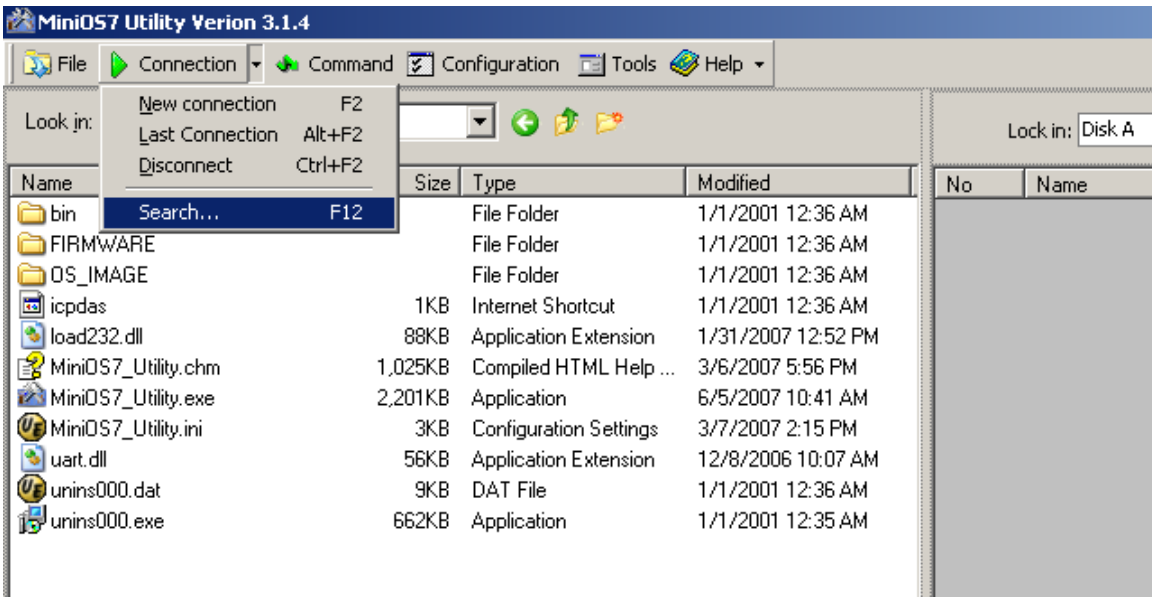
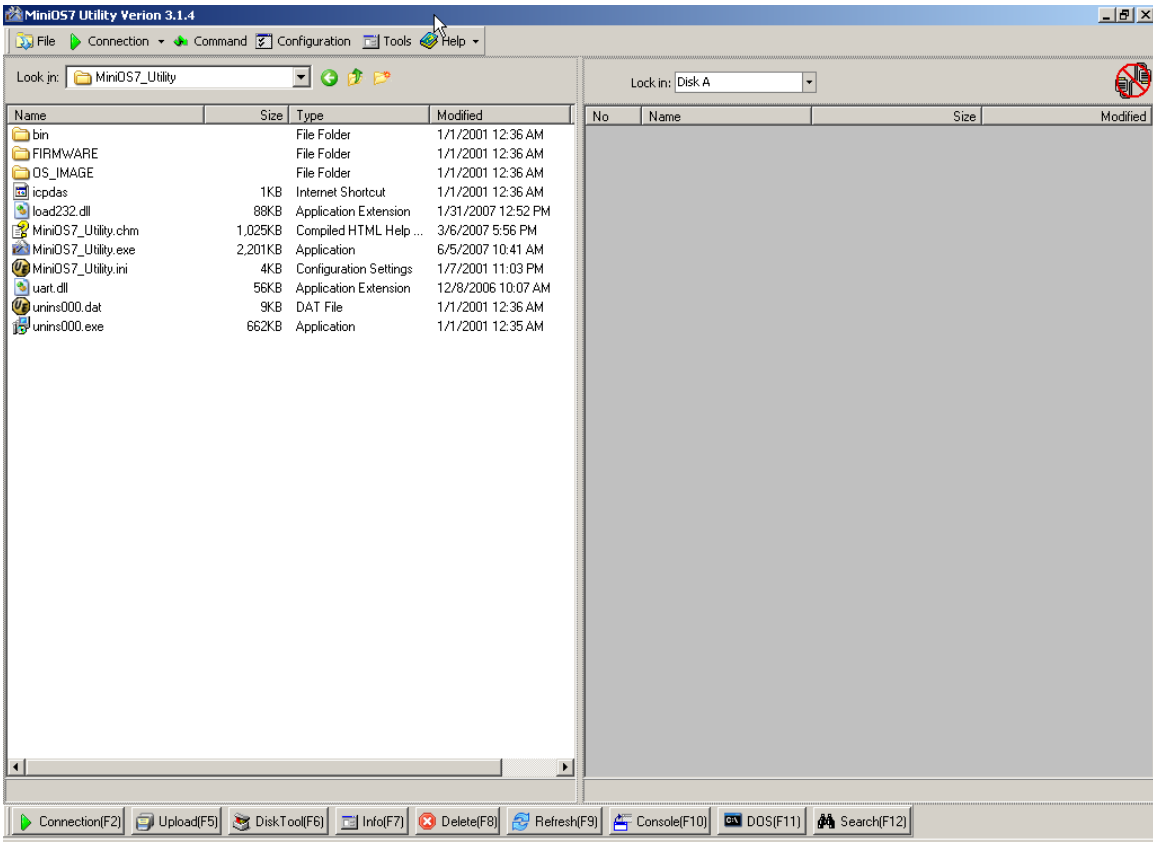
Step 2: Install the MiniOS7 Utility on the host PC by executing
CD:\NAPDOS\ET7000\Tools\Tools for MiniOS7\
MiniOS7_utility\MiniOS7_Utility.exe and follow the on-screen instructions

Step 3: Run the MiniOS7 utility as per the following diagram


MiniOS7 Utility Verion 3.1.4
File
Connection
Command
Configuration
Tools
Help
New connection F2
Last Connection Alt+F2
Disconnect Ctrl+F2
Search... F12
Look in:
Lock in: Disk A
Name Size Type Modified
bin File Folder 1/1/2001 12:36 AM
FIRMWARE File Folder 1/1/2001 12:36 AM
OS_IMAGE File Folder 1/1/2001 12:36 AM
icpdas 1KB Internet Shortcut 1/1/2001 12:36 AM
load232.dll 88KB Application Extension 1/31/2007 12:52 PM
MiniOS7_Utility.chm 1,025KB Compiled HTML Help ... 3/6/2007 5:56 PM
MiniOS7_Utility.exe 2,201KB Application 6/5/2007 10:41 AM
MiniOS7_Utility.ini 3KB Configuration Settings 3/7/2007 2:15 PM
uart.dll 56KB Application Extension 12/8/2006 10:07 AM
unins000.dat 9KB DAT File 1/1/2001 12:36 AM
unins000.exe 662KB Application 1/1/2001 12:35 AM
No Name

Step 4: Select the Connection item of main menu, and then click the “Search”.


MiniOS7 Utility Verion 3.1.4
File Connection Command Configuration Tools Help
Look in: MiniOS7_Utility
Lock in: Disk A
Name Size Type Modified
bin File Folder 1/1/2001 12:36 AM
FIRMWARE File Folder 1/1/2001 12:36 AM
OS_IMAGE File Folder 1/1/2001 12:36 AM
icpdas 1KB Internet Shortcut 1/1/2001 12:36 AM
load232.dll 88KB Application Extension 1/31/2007 12:52 PM
MiniOS7_Utility.chm 1,025KB Compiled HTML Help ... 3/6/2007 5:56 PM
MiniOS7_Utility.exe 2,201KB Application 6/5/2007 10:41 AM
MiniOS7_Utility.ini 4KB Configuration Settings 1/7/2001 11:03 PM
uart.dll 56KB Application Extension 12/8/2006 10:07 AM
unins000.dat 9KB DAT File 1/1/2001 12:36 AM
unins000.exe 662KB Application 1/1/2001 12:35 AM
No Name Size Modified
Connection(F2) Upload(F5) DiskTool(F6) Info(F7) Delete(F8) Refresh(F9) Console(F10) DOS(F11) Search(F12)

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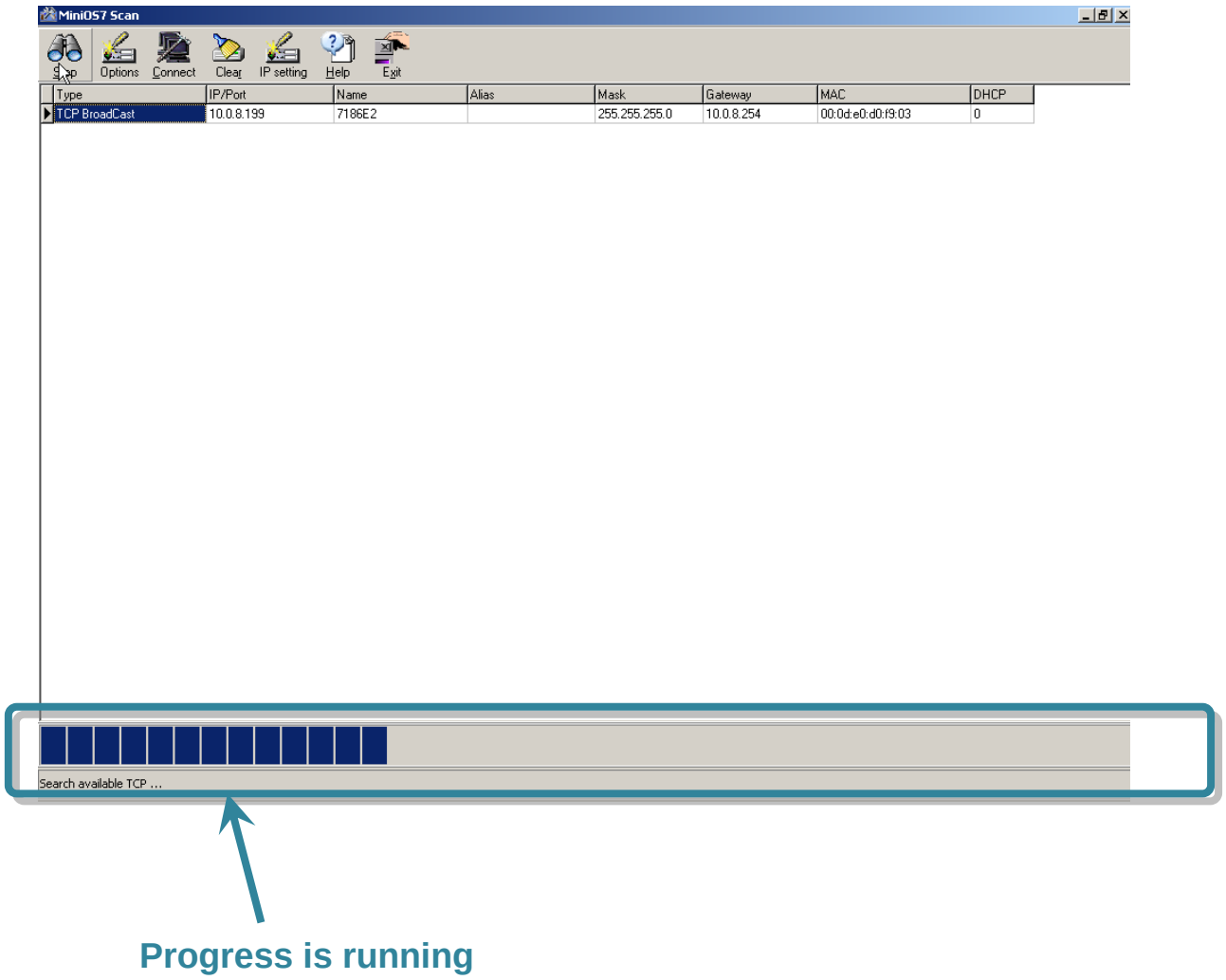
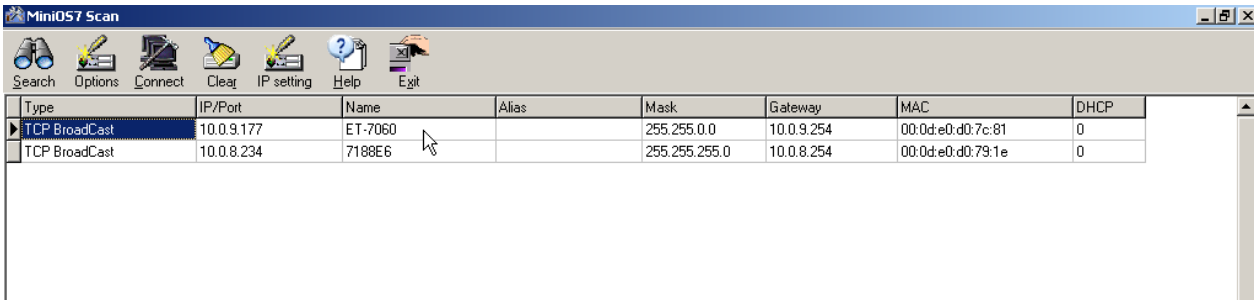
Step 5: The “MiniOS7 Scan” window appears, and starts to search the modules in the same Ethernet network of host PC.



Step 6: When the search is finished, click the ET-7000/PET-7000 module that you want to configure and then click the “IP setting” button.



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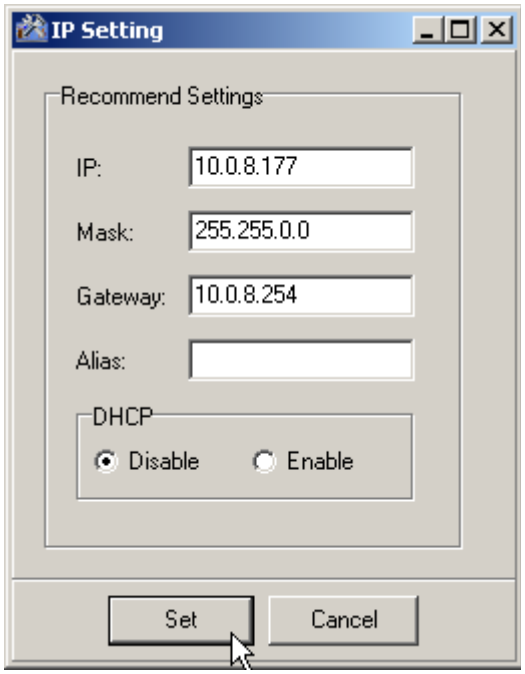
Step 7: IP Setting window appears



Step 7.1: Check that valid IP, Mask, Gateway, Alias, DHCP values has been inserted into the “Recommend Settings” fields.

Step 7.2: If these values are modified, the “Set” button must be clicked in order to create the new values.

Step 8: Exit the MiniOS7 Utility and restart the ET-7000/PET-7000 to enable the new settings to take effect

Tips & Warnings

Please refer to Appendix B for more details regarding the MiniOS7 Utility installation procedure.

2.1.2. Load Factory Default

Refer to “Load All Setup Default” in Sec 3.2.2 Basic Setting for more details regarding loading the factory defaults using the Web configuration.

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3. Web Application

ET-7000/PET-7000 series modules have a built-in Web configuration page with a friendly user interface making it simple to configure using the standard web browser. The configuration web page is optimized for Microsoft Internet Explorer 6.0, and the other browsers can work well, but the Web pages might appear differently.
All the configuration of ET-7000/PET-70000 is constructed on web page and you can only click the web to do everything through the on-board web pages using a standard web browser via Ethernet. Don't need extra tools or utilities on Windows to configure and control the ET-7000/PET-7000.

Opening the browser to connect the ET-7000/PET-7000

Step 1: Start up the Internet Explorer, and click the URL block at the top of the screen.

Step 2: Input the URL address of the ET-7000/PET-7000 (Such as http://192.168.255.1) into the URL block and press the "Enter" button to enter the login page.

Tips & Warnings

The Factory default IP address is 192.168.255.1

The default user name and password is Admin and Admin (Case sensitive)

If you forget the user name or password, the ONLY way to start configuring ET-7000/PET-7000 is to load factory default by using the web/console configuration

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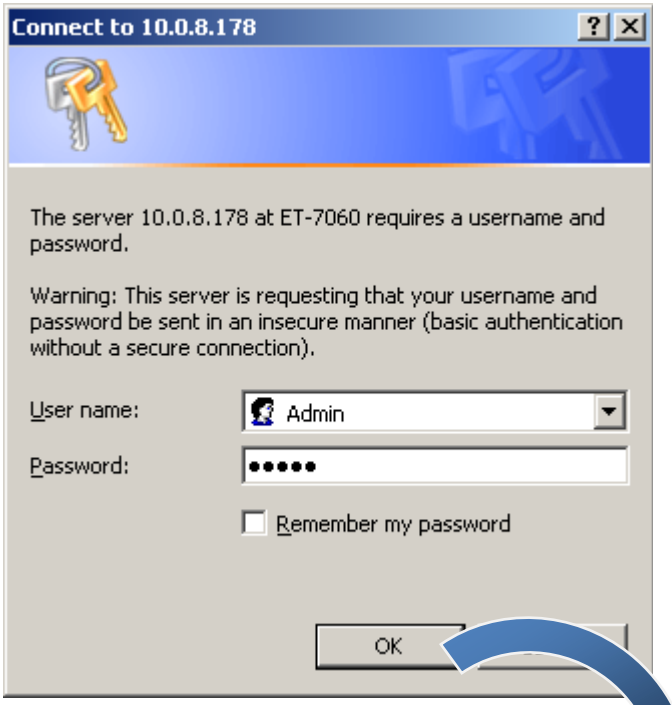
Step 3: Input the User Name and password on the dialog, and then click the “OK” button. (See the dialog box below)


Connect to 10.0.8.178
The server 10.0.8.178 at ET-7060 requires a username and password.
Warning: This server is requesting that your username and password be sent in an insecure manner (basic authentication without a secure connection).
User name:
Admin
Password:
Remember my password
OK

After the user name and password is accepted by the ET-7000/PET-7000, The ET-7000/PET-7000 home page will be displayed.

Tips & Warnings

If either the user name or the password is incorrect or is left blank, the main home page and the other pages will not be accessible, so ensure that the input data is correct and rectify it if and as necessary.

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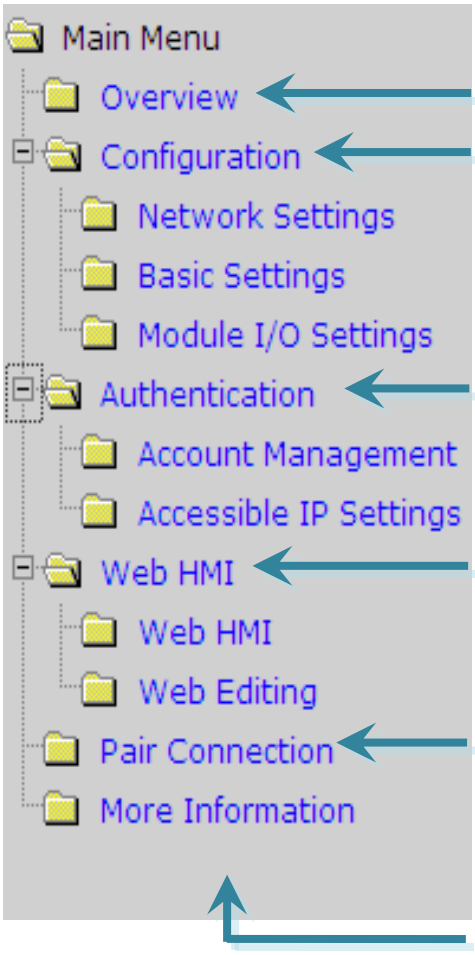
The brief description of the Web page configuration function is listed on six main functions of the tree structure.



Overview: A brief introduction to the six functions

Configuration: Network Settings, Serial Port, Basic and Module I/O Settings

Authentication: Account Management and Accessible IP Settings

Web HMI: Web Human-Machine Interface and Web Editing

Pair Connection: Create the I/O mapping for two identical ET-7000/PET-7000 series modules.

More Information: Detailed specifications and more information about the ET-7000/PET-7000 series

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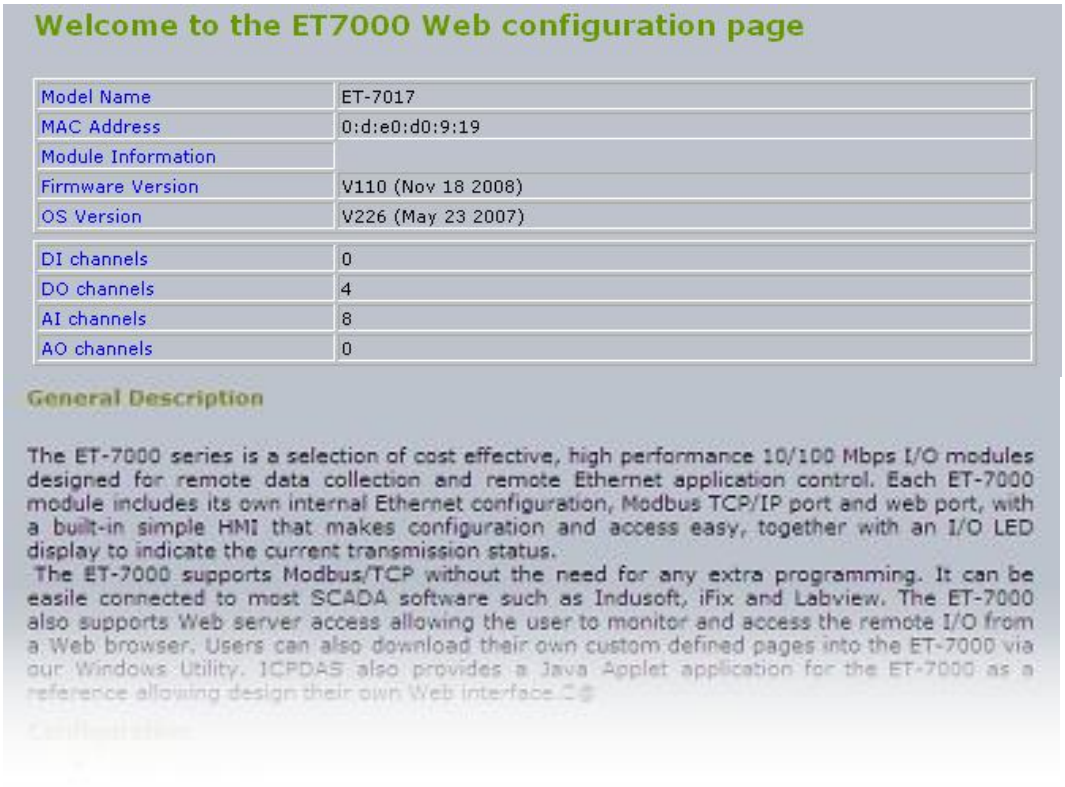
3.1. Overview

The Welcome page for the ET-7000/PET-7000 contains information related to the currently accessed ET-7000/PET-7000 series module, as shown below:

- **Model Name:**
  ET-7000/PET-7000 series module name (The default is the ET-7000/PET-7000 series name. It allows a maximum length of 8 characters)
- **MAC address:**
  The MAC address of the currently accessed ET-7000/PET-7000 series module
- **Module Information:**
  The alias name of the ET-7000/PET-7000 series module
- **Firmware Version:**
  The version number and date of the default firmware
- **OS Version:**
  The version number and date of the operating system
- **DI/DO/AI/AO channel:**
  The number of DI/DO/AI/AO channels depends on the specifications of the ET-7000/PET-7000 module.


Welcome to the ET7000 Web configuration page
Model Name
ET-7017
MAC Address
0:d:e0:d0:9:19
Module Information
Firmware Version
V110 (Nov 18 2008)
OS Version
V226 (May 23 2007)
DI channels
0
DO channels
4
AI channels
8
AO channels
0
General Description
The ET-7000 series is a selection of cost effective, high performance 10/100 Mbps I/O modules designed for remote data collection and remote Ethernet application control. Each ET-7000 module includes its own internal Ethernet configuration, Modbus TCP/IP port and web port, with a built-in simple HMI that makes configuration and access easy, together with an I/O LED display to indicate the current transmission status.
The ET-7000 supports Modbus/TCP without the need for any extra programming. It can be easile connected to most SCADA software such as Indusoft, iFix and Labview. The ET-7000 also supports Web server access allowing the user to monitor and access the remote I/O from a Web browser. Users can also download their own custom defined pages into the ET-7000 via our Windows Utility. ICPDAS also provides a Java Applet application for the ET-7000 as a reference allowing design their own Web interface.

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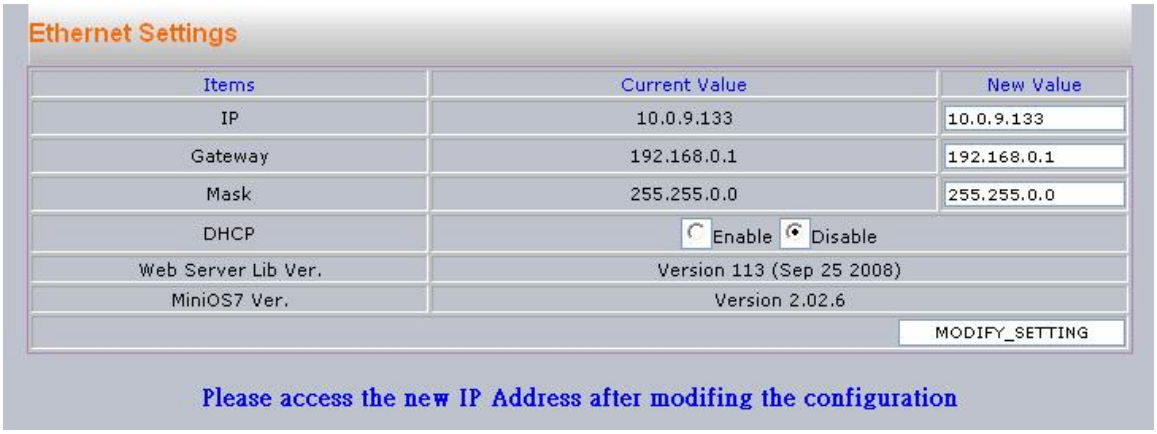
3.2. Configuration

3.2.1. Ethernet Settings



The Ethernet settings page can be used to view and change the TCP/IP network settings for the ET-7000/PET-7000 module.

Settings	Description	Range	Factory default
IP	4-byte IP address. Each ET-7000/PET-7000 module needs an IP address so that if can be identified on the network	X.X.X.1 To X.X.X.254	192.168.255.1
Gateway	4-byte Gateway. A gateway is a network address that acts as an entrance to another network. Usually, computers that control the traffic within the network or at the local Internet Service Provider (ISP) are gateway nodes.	X.X.X.0 To X.X.X.254	192.168.0.1

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Mask	4-byte subnet Mask. A subnet mask represents all the network hosts at one geographic location on the same local area network. When an Ethernet packet is sent across the network, the ET-7000-/PET-7000 will use the subnet Mask to check whether the TCP/IP host specified in the packet is on local network segment.	X.X.X.0 To X.X.X.255	255.255.0.0
DHCP	Select this option If there is a DHCP server on the network, the server can assign the IP address automatically.	0 (Disable) 1(Enable)	0 (Disable)
Firmware Ver.	Firmware Version and Date	N/A	Varies depending on the Module
MiniOS7 Ver.	MiniOS7 Version and Date	N/A	Varies depending on the Module

- **DHCP Function**

DHCP (Dynamic Host Configuration Protocol) is a method used to dynamically assign temporary numeric IP addresses as required.

When the DHCP function is enabled, the ET-7000/PET-7000 module will automatically load the IP/Mask/Gateway address saved in the EEPROM if the ET-7000/PET-7000 cannot get a dynamic IP address from the DHCP server on boot up. This may occur if the DHCP server is unavailable or if the Ethernet cable/device between the module and the Host PC is damaged.

In this situation, the ET-7000/PET-7000 will not continue to make requests to the DHCP server until the next reboot, even if the DHCP function is enabled.

Tips & Warnings

For correct IP/Mask/Gateway address information, please consult the network administrator.

If you don’t have a DHCP server available on the network, it is recommended that the DHCP function be disabled.

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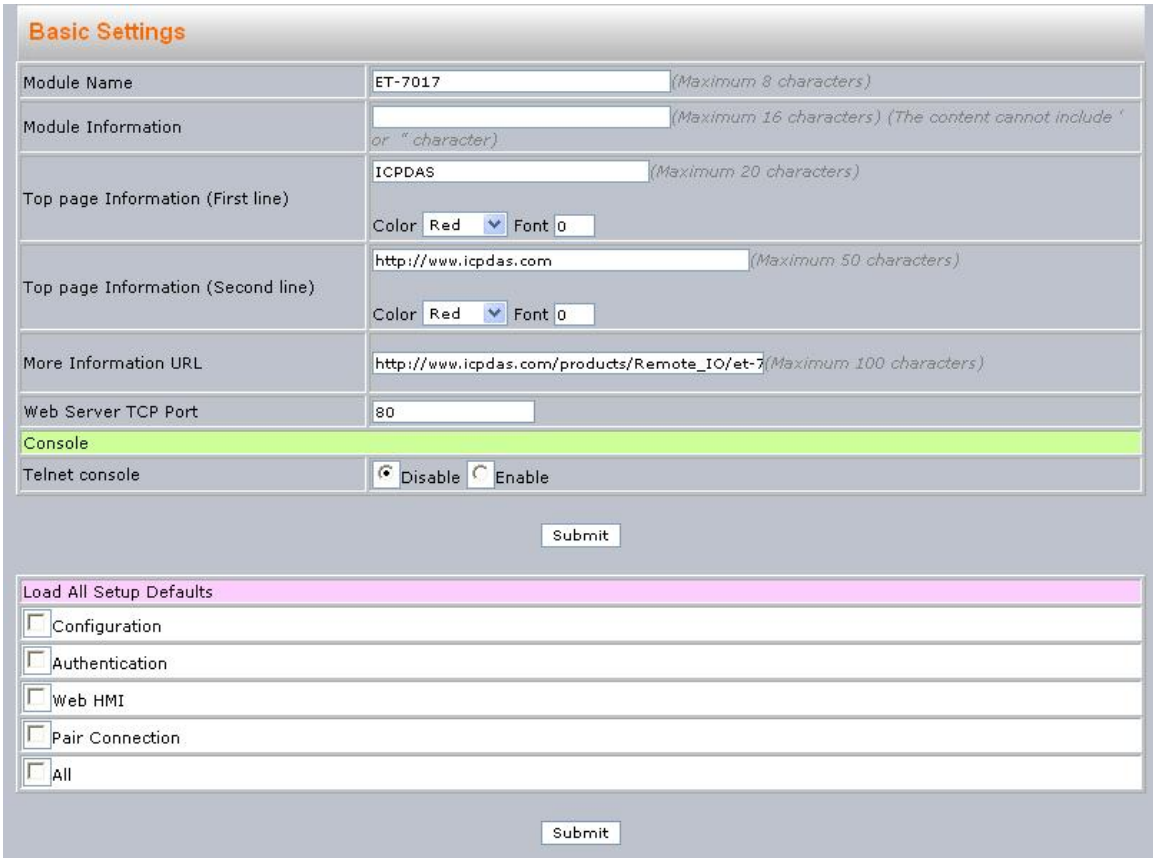
3.2.2. Basic Setting



- **Module Name:**
  The initial value will be the default module name. The ET-7000/PET-7000 module supports a maximum file module name length of 8 characters. (Unavailable)
- **Module Information:**
  Indicates the alias name given to the module and can be modified by the user. The name can be a maximum of 16 characters, but cannot include single or double quotes (“ or “ character).

After the new values are submitted, the Module Name and Module Information will be updated. The new details can be verified by viewing the main.htm (Overview of tree), while you submit the new value.

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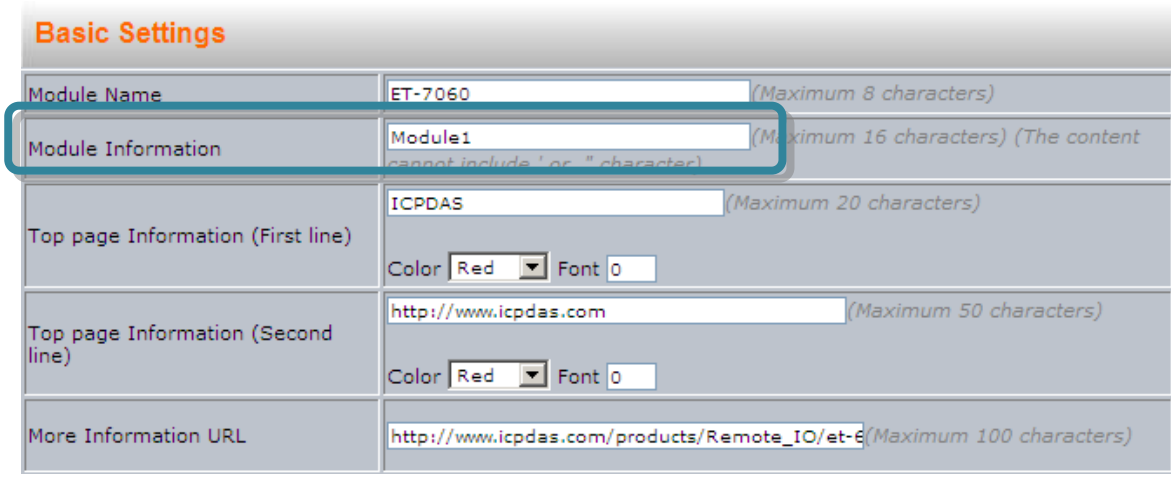
Example

Step 1: Enter a string into the Module Information text field, for example, Module1.

Step 2: Click Submit to enable the settings to take effect.



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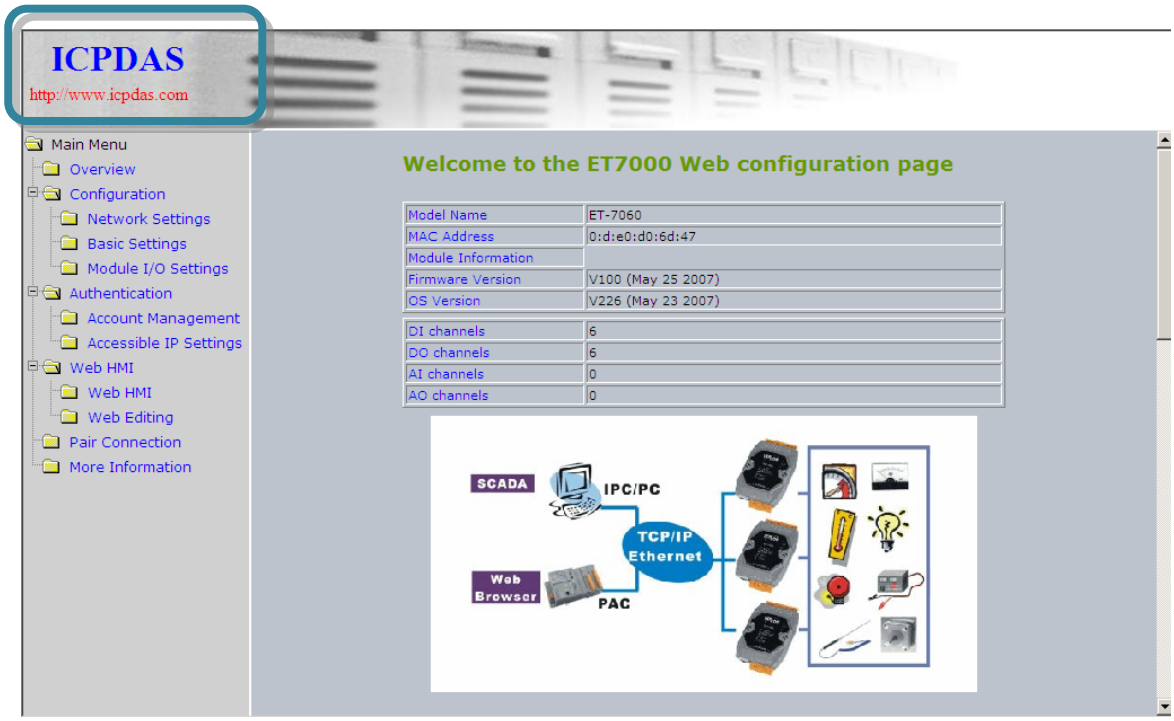
- **Top page Information (first line) and Top page Information (second line)**

  The top page information is displayed at the top of the web page, as shown below, and can be modified to enable custom information to be displayed.



After submitting the new details, the Top page Information will be updated and will be displayed at the top of the web configuration page.

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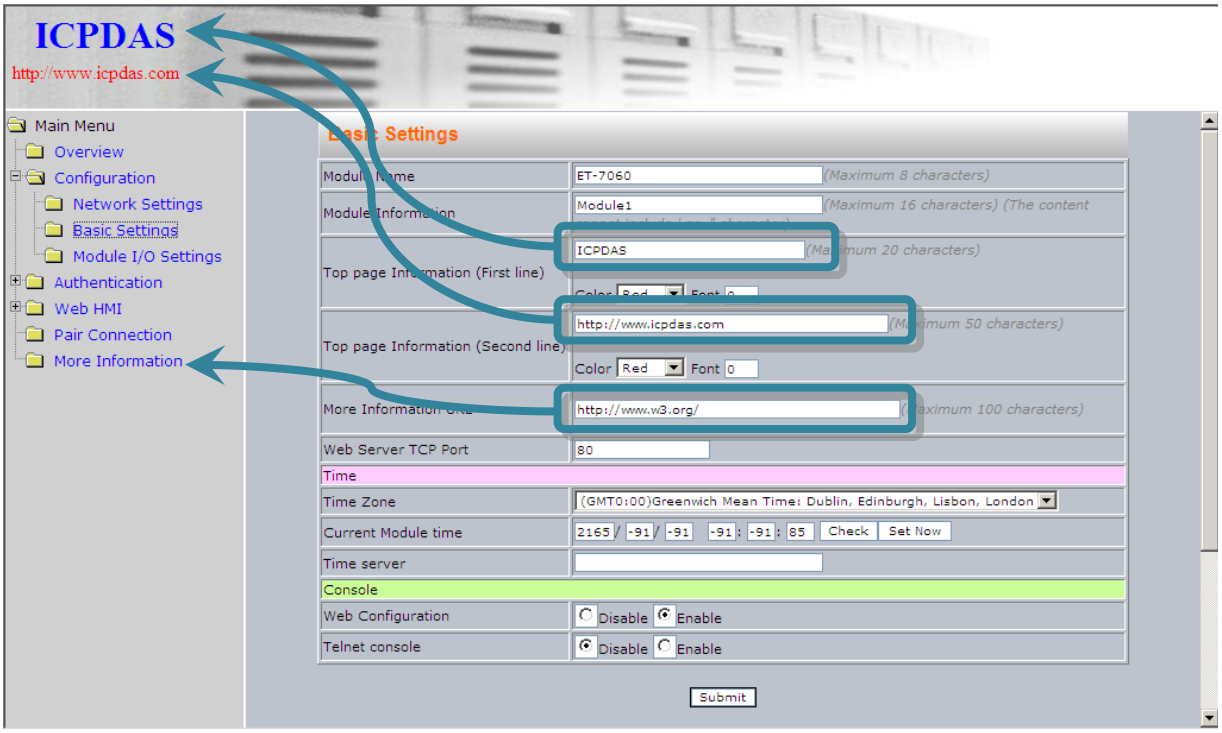
Example

Step 1: Enter a string in the Top page Information (First line) and Top page Information (second line) text fields, for example “ICP DAS” and “http://www.icpdas.com”.

Selecting an option from the color drop down box and entering a value in the font text field can modify the font size and color.

Step 2: Click Submit button to enable the settings to take effect.

Step 3: Link to index.htm again or refresh the top page.



- **More Information URL**

  It may often be helpful to provide users with additional information while browsing the Web Configuration page.

  After submitting the new details, the More Information link in the Main menu tree will be updated.

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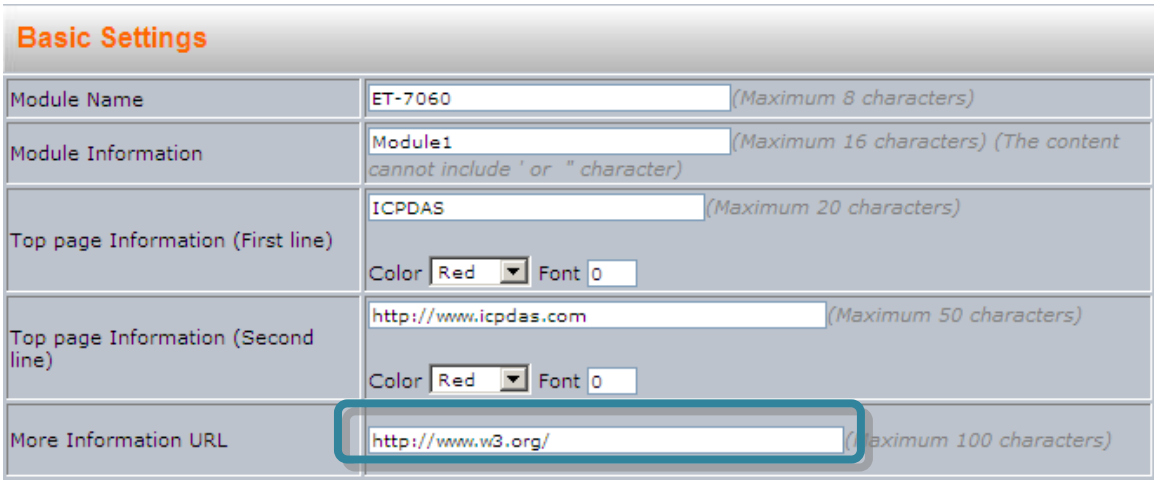
Example

Step 1: Enter a URL in the “More Information URL” text field, for example “http://www.w3.org”. (The URL may be either an external site or a link to a page on your intranet)

Step 2: Click Submit button to enable the settings to take effect.

Step 3: Link to index.htm again or refresh the top page.



Clicking the “More Information” in the Main Menu tree will automatically open the web page defined in the More Information URL.

ICPDAS
http://www.icpdas.com
Main Menu
Overview
Configuration
Authentication
Web HMI
Pair Connection
More Information
WORLD WIDE WEB
consortium
Leading the Web to Its Full Potential...
Activities | Technical Reports | Site Index | New Visitors | About W3C | Join W3C | Contact W3C
The World Wide Web Consortium (W3C) develops interoperable technologies (specifications, guidelines, software, and tools) to lead the Web to its full potential. W3C is a forum for information, commerce, communication, and collective understanding. On this page, you'll find W3C news, links to W3C technologies and ways to get involved. New visitors can find help in Finding Your Way at W3C. We encourage organizations to learn more about W3C and about W3C Membership.
W3C Supporters
Help W3C by making a donation through the W3C Supporters Program.
Mobile Web Initiative
Seeking position papers for the Workshop on Mobile Ajax, 28 September in Santa Clara, CA (USA). Papers are due 15 August. Read more about the
News
Voice Recommendations Approved for Speech-Driven Web Applications
2007-06-19: The World Wide Web Consortium today released Voice Extensible Markup Language (VoiceXML) 2.1 as a W3C Recommendation, confirming the standard for voice-driven Web applications. Used daily in
Search
Google
Search W3C
Go
Search W3C Mailing Lists
Testimonials

The default URL for “More information” is http://www.icpdas.com/products/Remote_IO/ET-7000/PET-7000/ET-7000/PET-7000_introduction.htm

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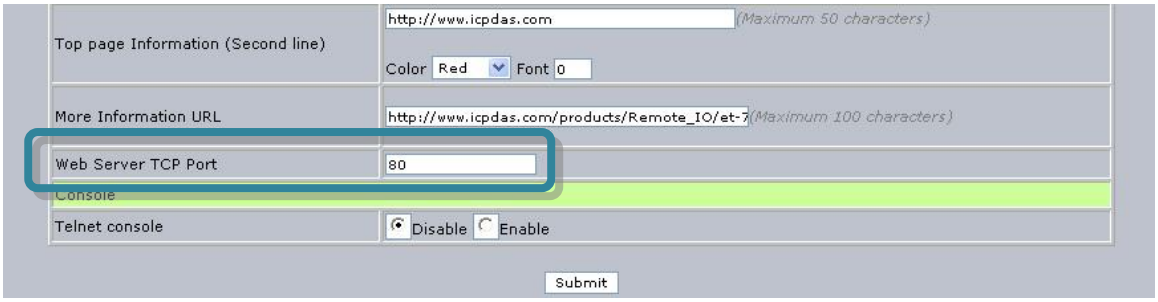
- **Web Server TCP Port**

  The default well known port that is used in TCP to name the ends of logical connections for Web server of ET-7000/PET-7000 is 80.

  It allows the user to change the port to the other, (0~65535).



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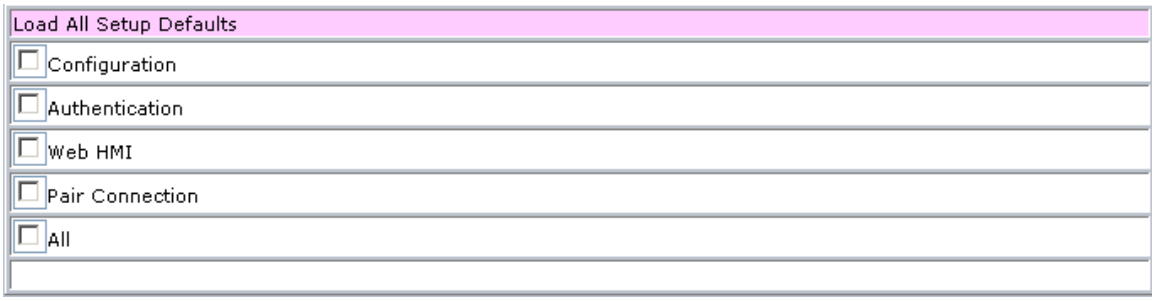
- **Load All Setup Default**



Function Name	Details	Factory Default
Configuration	All of the Ethernet settings	Refer to Sec. 3.2.1
	All of the Module I/O settings	Refer to Sec. 3.2.3.
Authentication	Account management	The default account is “ Admin” and the password is “ Admin”
	IP filter settings	Allow all of the IP connections
Web HMI	Web Page editing function	0 pages
Pair Connection	I/O Pair connection	Disabled
All	Set the factory default value for the 4 main functions above. (Configuration, Authentication, Web HMI, Pair Connection)	Refer to the function details above

Press the Submit button to allow the settings to take effect.

Tips & Warnings

Be aware that after modifying the settings and submitting the new information, all previous settings for the module will be lost.

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3.2.3. Module I/O Settings

Different Modbus setting functions will be displayed on this page depending on the type of ET-7000/PET-7000 module. All settings can be divided into either common, DI, DO, AI and AO settings.
Please refer to Appendix C for more details regarding ET-7000/PET-7000 Modbus register table.
The illustration below shows the Modbus settings for the ET-7060 module

Modbus Settings (Common Functions)

Modbus Address	Function	Action
126	Recover all I/O default settings	☐ *1=recover*
129	Web Enable/Disable	☑ *0=disable/1=enable (default=1)*
133	Reboot ET-7000	☐ *1=reboot*
40255	CPU reset status	1 *1= power on/2= 0.8 second WDT/3= Reset command*
40256	CPU reset events	18071 *reset count*
40257	Set host watch dog timer	33023 *5:Disable 5~65535:Enable (unit:second) (default=0)*
40258	Host WDT events	0 *WDT count*

Modbus Settings (DI Latch)

Modbus Address	Function	Action
32	Clear all DI latched Status (High)	0 ☐ *1=clear*
33	Clear all DI latched status (Low)	0 ☐ *1=clear*
150	Enable all DI latched status(High/Low)	☑ *0=disable/1=enable (default=0)*

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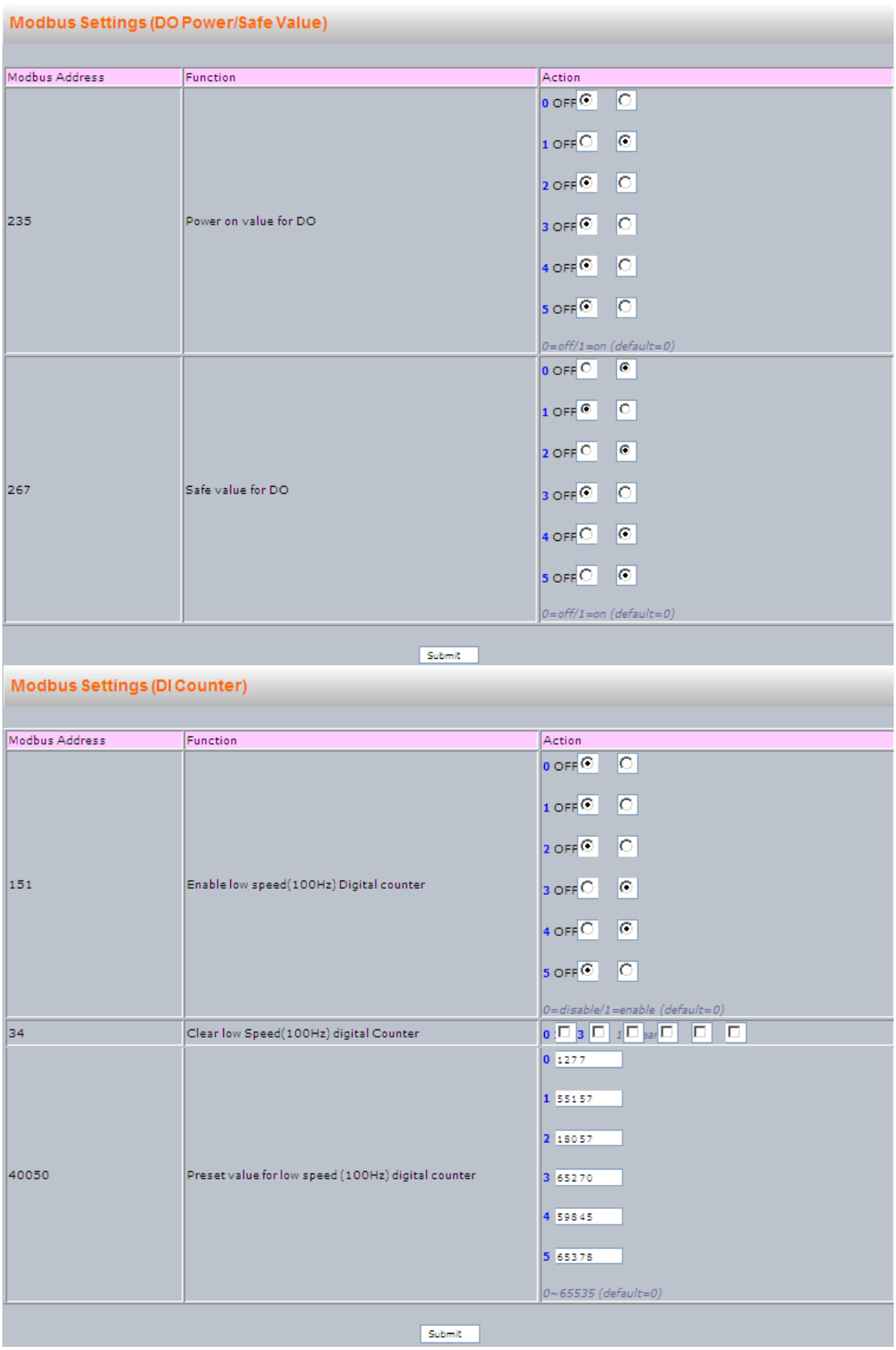

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- **Common Functions**

Modbus Address	Points	Description	Range	Factory default
40557	1	Set host watch dog timer (Second)	5 ~ 65535 (Enable) (< 5: Disable)	0 (Disable)

- **DO Module Functions**

Modbus Address	Points	Description	Range	Factory default
00435 ~ 00514	80	Power on value for DO	0= off/1= on	0
00515 ~ 00594	80	Safe value for DO	0= off/1= on	0

- **AI Module Functions**

Modbus	Points	Description	Range	Factory default
00595 ~ 00626	32	Enable/Disable AI channel	0= disable 1= enable	1
00628	1	Normal/Fast mode for AI	0= normal (16 bit) 1= fast (12 bit)	0
00629	1	50/60 Hz rejection for AI	0= 50 Hz 1= 60 Hz	1
40296 ~ 40327	32	High alarm value for AI	-32768 ~ +32768	32767
40328 ~ 40359	32	Low alarm value for AI	-32768 ~ + 32767	-32768
40700 ~ 40731	32	High alarm mode	0= moment 1= latched	0
40732 ~ 40763	32	Low alarm mode	0= moment 1= latched	0
40427 ~ 40458	32	Type code for AI	Refer to type code table	Depends on the type of Module

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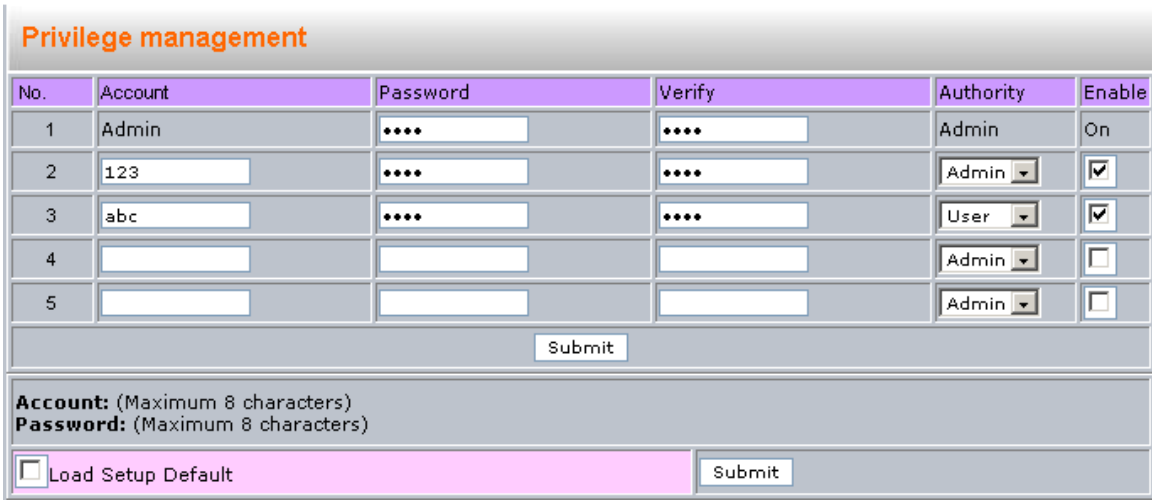
3.3. Authentication

3.3.1. Account management



Each ET-7000/PET-7000 series module provides access privilege for up to five user accounts including a default Admin account and four general user-defined accounts. Each of the user-defined accounts can be assigned either Admin or general user privilege.

Assigning Admin privilege allows the account to read and write configuration settings but the general user account is restricted to read only access. The maximum number of characters that can be used for an account name is 8.

Each of the account requires password authentication. The maximum number of characters allowed for the password is 8.

- **Load Setup Defaults**

Load the factory default Account management settings. All current accounts will be deleted, except the Admin account, and the password of Admin account will revert to “Admin”.

Press the Submit button to enable the settings to take effect.

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Tips & Warnings

The default account is called “Admin” and the password is also “Admin”. The password and the Admin account can be changed, but the account name cannot be changed or deleted.

If you forget the password for the Admin account, the ONLY way to configure the ET-7000/PET-7000 is by using the “Reset to Factory default” option. (Please refer to Load All Setup Default on Sec. 3.2.3 for more information)

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3.3.2. IP filter Settings

Each ET-7000/PET-7000 series module contains an IP filter that can be used to control access to the module, thereby preventing unauthorized access from unknown IP addresses.

The IP filter can be granted across a range of IPv4 addresses, such as from 10.0.8.1 to 10.0.9.22 or to a single IP address, with a maximum of ten permission rules. Once the IP addresses that have been granted access permission have been entered, and the rule activated, the ET-7000/PET-7000 module IP filter will guard the TCP/IP connection by restricting access to any unauthorized IP addresses.

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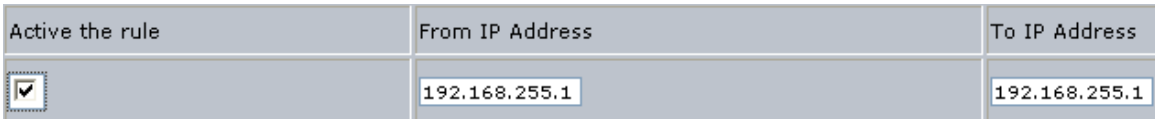
There are three methods of restricting or granting access permissions.

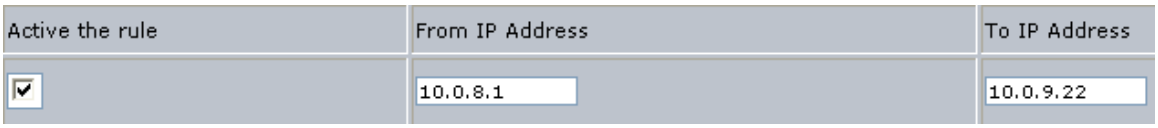
- **Allow Only a specific IP address**

  Enter the same IP address in both the From and To IP Address text fields



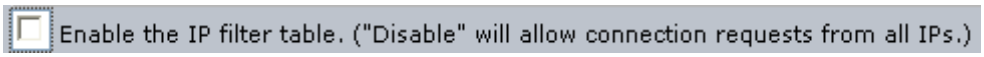
- **Allow Hosts within a specific IP address range**

  Enter the first IP address in the From IP Address text field, and enter the last IP address in the permitted range in the To IP Address text field.



- **Allow access from any IP address**

  Disable IP filter function to allow access to the ET-7000/PET-7000 module from any address.



The “Enable the IP filter table” checkbox must be checked when granting permissions to either a single IP address or a range of IP address.

Press the

button to enable the settings to take effect.

Tips & Warnings

The IP filter is set to “disabled” by default, meaning that access to the ET-7000/PET-7000 module is allowed from any IP address.

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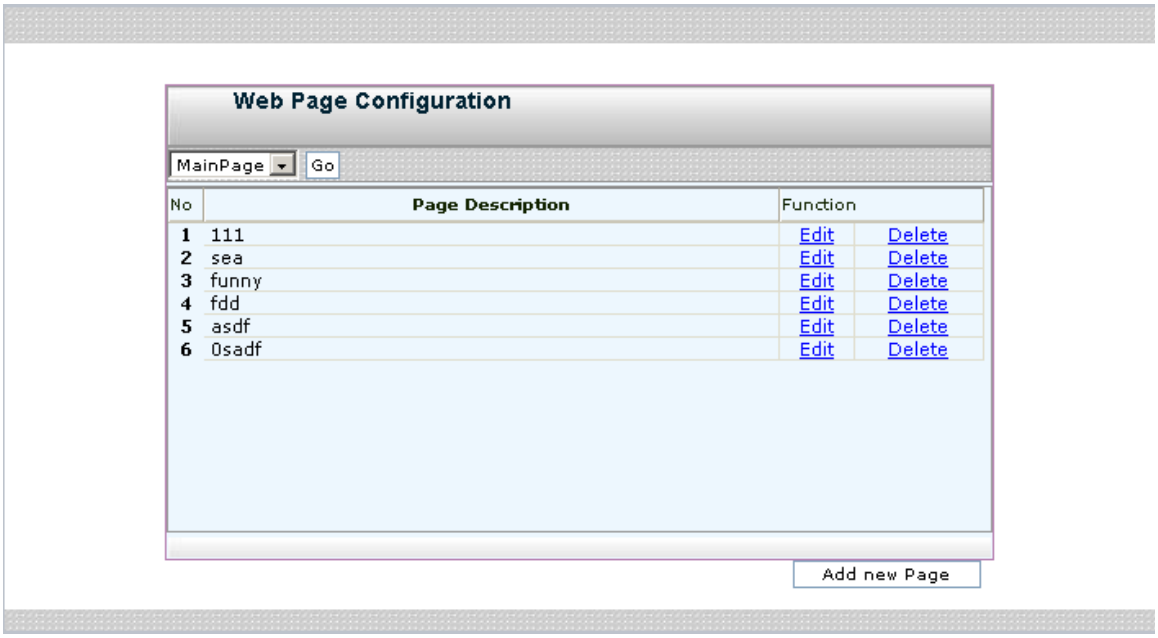
3.4. Web HMI

3.4.1. Web Edit

The Web page configuration can be used to create a user-defined Web page.



How to -

- **Add a new page**

  Click the “Add new Page” button to create a new page.

- **Edit a page**

  Click the “Edit” link to edit the selected page.

- **Delete a page**

  Click the “Delete” link to remove the selected page.

The list box on the left hand side of the “Web Page Configuration” window lists all existing pages including the main page, pair connection page.

A maximum of 10 pages can be created.

Go : Browses the Web HMI with the name listed on the list box.

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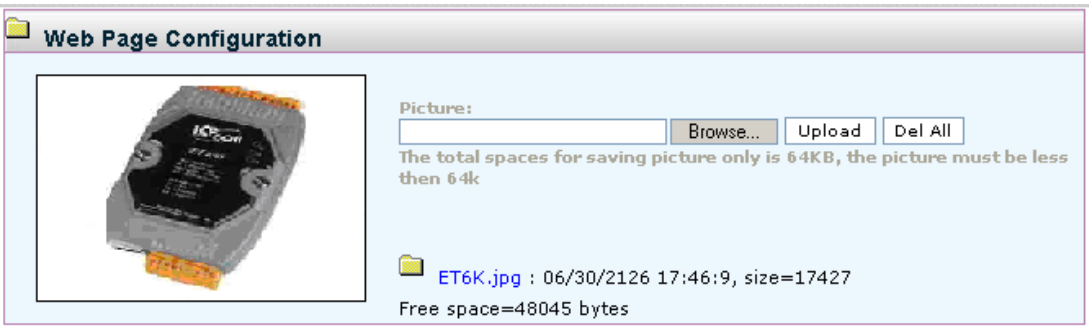
Tips & Warnings

By default, no existing pages will be listed in the Web Page Configuration window.

The “Main page” shown in the HMI list box located on the left hand side of the “Web Page Configuration” window is a standard default Web HMI page and cannot be deleted.

The Pair Connection Page can be enabled by enabling the I/O pair connection function in the “Pair connection” section of the Main menu tree. Please refer to Sec 3.5 for more details.

- **Page Properties**



Group

	Register	Alias	Scaling	Type	Data type		
1	1	Voltage1	1	Holding	Signed 16	Edit	Clear
2	1	Voltage1	0	Coil	Boolean	Edit	Clear
3						Edit	Clear
4	0	DO0	0	Coil	Boolean	Edit	Clear
5						Edit	Clear
6						Edit	Clear
7						Edit	Clear
8						Edit	Clear
9						Edit	Clear
10						Edit	Clear

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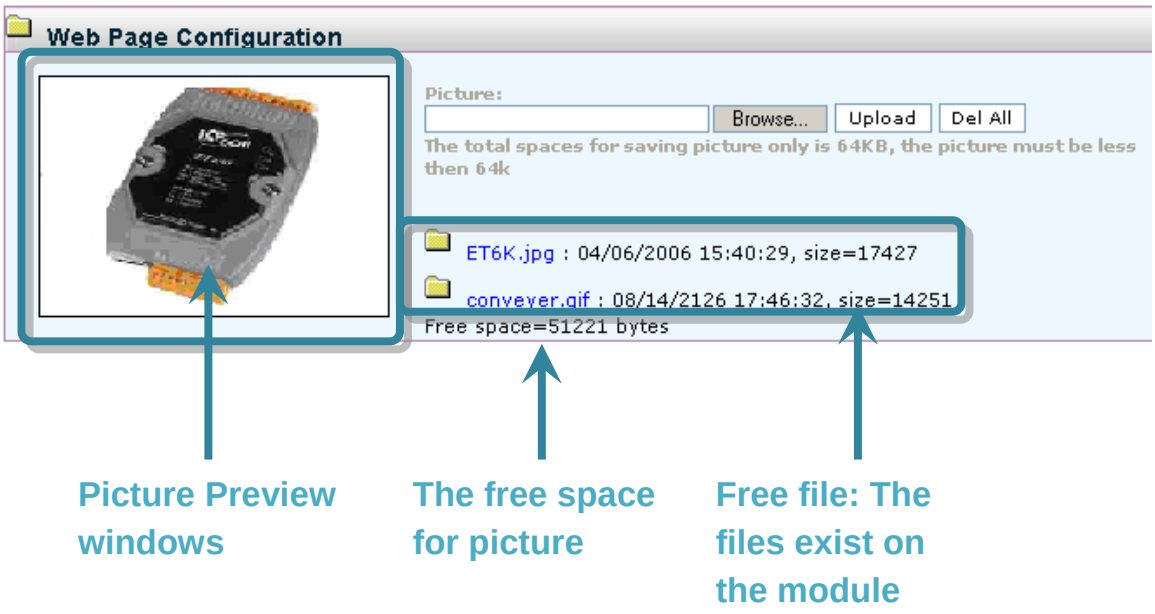
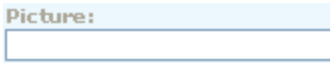
- **All properties can be configured on this page**


Web Page Configuration
Picture:
Browse...
Upload
Del All
The total spaces for saving picture only is 64KB, the picture must be less then 64k
ET6K.jpg : 04/06/2006 15:40:29, size=17427
conveyer.gif : 08/14/2126 17:46:32, size=14251
Free space=51221 bytes
Picture Preview windows
The free space for picture
Free file: The files exist on the module

A maximum of 10 items in each group can be configured.



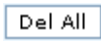
: The image file name selected by clicking the “Browse” button.

The image file type can be either of .jpg, .gif or .bmp. The recommended resolution for the image to be displayed on the Editing Web page is 340 * 250 pixels.

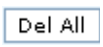
Each ET-7000/PET-7000 series module has a maximum storage space of 64KB.

: Browse a directory on the local disk to select an image file to be uploaded to the ET-7000/PET-7000 module.

: Upload the selected image file to the ET-7000/PET-7000 module.



: Delete all files that are currently stored on the ET-7000/PET-7000 module.

Click the 

button to delete all files that currently exist on the ET-7000/PET-7000 module.

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Tips & Warnings

The “Del All” action will delete all files currently stored on the ET-7000/PET-7000 module, and it cannot be used to delete individual files.

The ET-7000/PET-7000 will reboot after deleting the files.

- **Page Name**

  This field can be used to give the page a more descriptive name. The maximum number of characters that can be used for a page name is 10.

- **Image**

  Use the list box to choose the image to be displayed in the preview window.

- **Save**

  The information displayed on this page will be saved after clicking this button.

- **Set as the Start Page**

  Clicking the checkbox to make the current page to be displayed when clicking the Web HMI link in the Web HMI section of the Main Menu tree.

Edit : Clicking this button will link to the “Edit Group Register” page to allow the point information to be edited.

Clear : Click the “Clear” button to delete the point information.

Refer to next Section for more details regarding the definition of the field if the “Group” Table.

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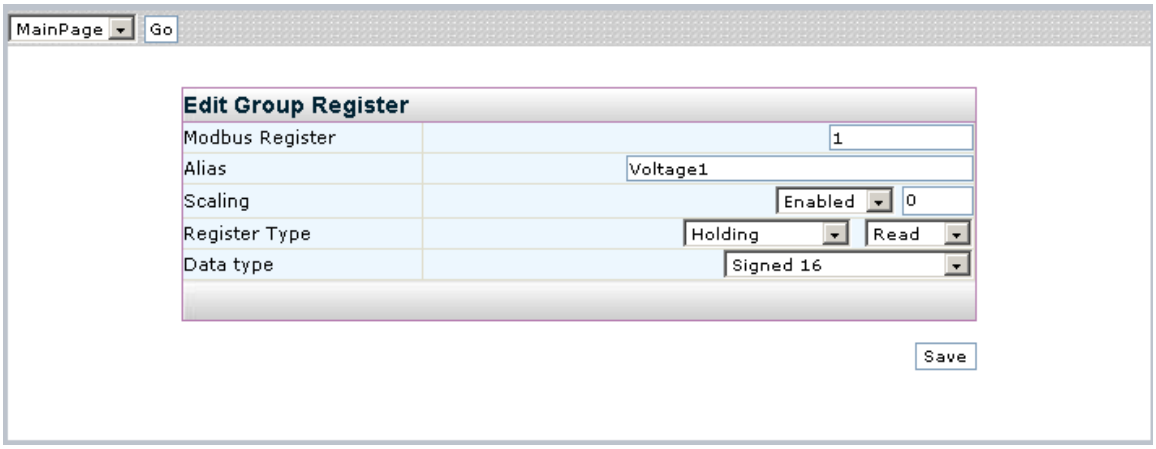
Editing the Group Register



- **Modbus Register**

  The Modbus Register number for the ET-7000/PET-7000 module

- **Alias**

  A string that describes the Modbus register. It can be a reference to a tag in the image of the Web editing page that is selected from the “Page properties” section. (If the tag of the Modbus register has defined on the image)

- **Scaling**

  The Modbus register value will be divided by the scale value before being displayed on the web page, or multiplied before value is written to the ET-7000/PET-7000 module.

  This function is only used for Input or Holding register types.

  - Enable: Enable the Scaling function
  - Disable: Disable the Scaling function

Example

1. Modbus register value= 620, Scale value=10 (62.0 will be shown on the Web page)
2. Modbus register value=7325, Scale value=1000 (7.325 will be shown on the Web page)
3. Web page input= 32.20, Scale value=100 (3220 will be written to the Modbus register)

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- **Register Type**

  Defines the Modbus register type.

  Bit format: Coil (Digital Output), Discrete input (Digital Input).

  Byte format: Input (Analog Input), Holding (Analog Output).

- **Data Type**

  Defines the data type of the Modbus register and must be either Input or Holding. The data type can be one of the following:

Data Type	Definition
Unsigned 16	A 16-bit positive value
Signed 16	A16-bit value with a sign
Unsigned 32	A 32-bit positive value. The Most significant word (register) is on the low address
Signed 32	A 32-bit value with sign. The Most significant word (register) is on the low address
Unsigned 32 (swapped)	A 32-bit positive value. The Most significant word (register) is on the high address.
Signed 32 (swapped)	A 32-bit value with sign. The Most significant word (register) is on the high address.
Float	A 32-bit floating point. (IEEE754). The Most significant word (register) is on low address.
Float (swapped)	A 32-bit floating point. (IEEE754). The Most significant word (register) is on high address.

Click the Save button to save all settings.

The diagram below shows an example of how to select a Coil register type with a Modbus Register Address of 1 and Alias name of Voltage 1.

Other text fields that aren't related to the Coil register type will be disabled.

The Modbus Register and Alias text fields are only related to the Coil and Discrete Input register types, but the other fields aren't related.

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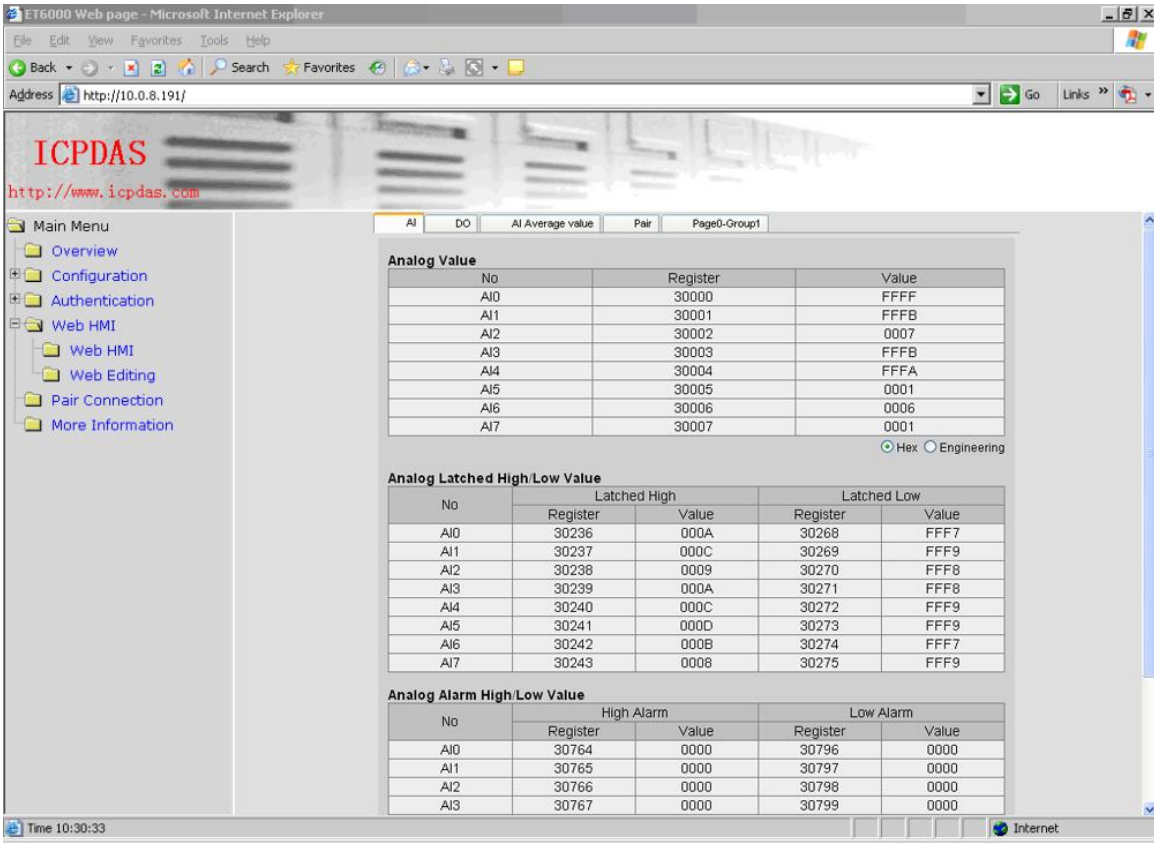
3.4.2. Web HMI

The first page displayed in the client Web browser will be the page that is defined by clicking the “Set as Start Page” checkbox on the “Page properties” area of the “Web page configuration” page in the “Web Editing” section of the Main Menu tree. The default start page is the Main Web HMI page shown as follow.



The Main Web HMI page shows all the components of the ET-7000/PET-7000. For example, the Main Web HMI page for an ET-7017/PET-7017 module will display the 4 DO and 8 AI components.

Title Name	Description	Notes
No.	The Component type and address	
Register	The Register address	
Value	AO: A numeral of Integer or float	
Latched High	AI High Latch value	
Latched Low	AI Low Latch value	
High Alarm	AI High Alarm value	
Low Alarm	AI Low Alarm value	

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Title Name	Description	Notes
No.	The Component type and address	
Register	The Register address	
Status/Action	DO: ON (1), OFF (0)	

- **Connection Status**

The status indicates the connection status of the IO component on ET-7000/PET-7000 module defined on the cell of IO channel and Modbus register mapping table

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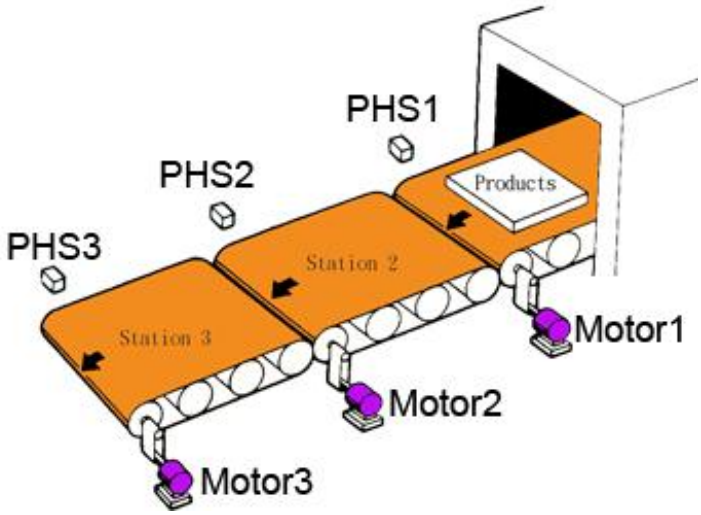
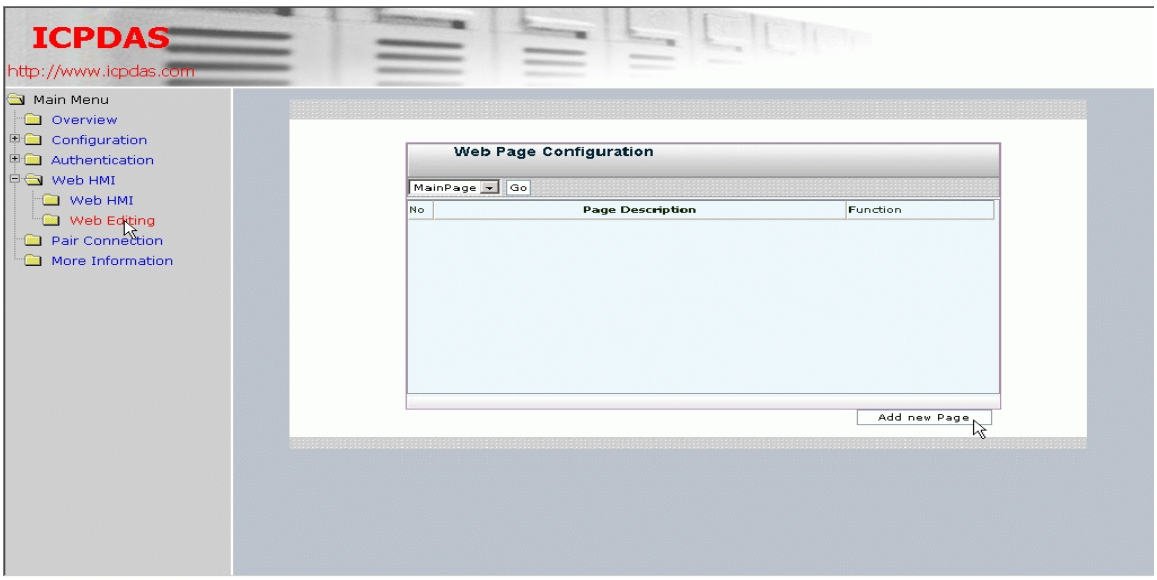
Example: How to create a Web Editing Page

Create a Web page to monitor the I/O of the conveyer system shown below. The I/O system contains 3 photo sensors that are used to detect the products, and 3 switches that are used to turn the conveyer motor on and off.



Click the “Add new Page” button to create a new editing page.



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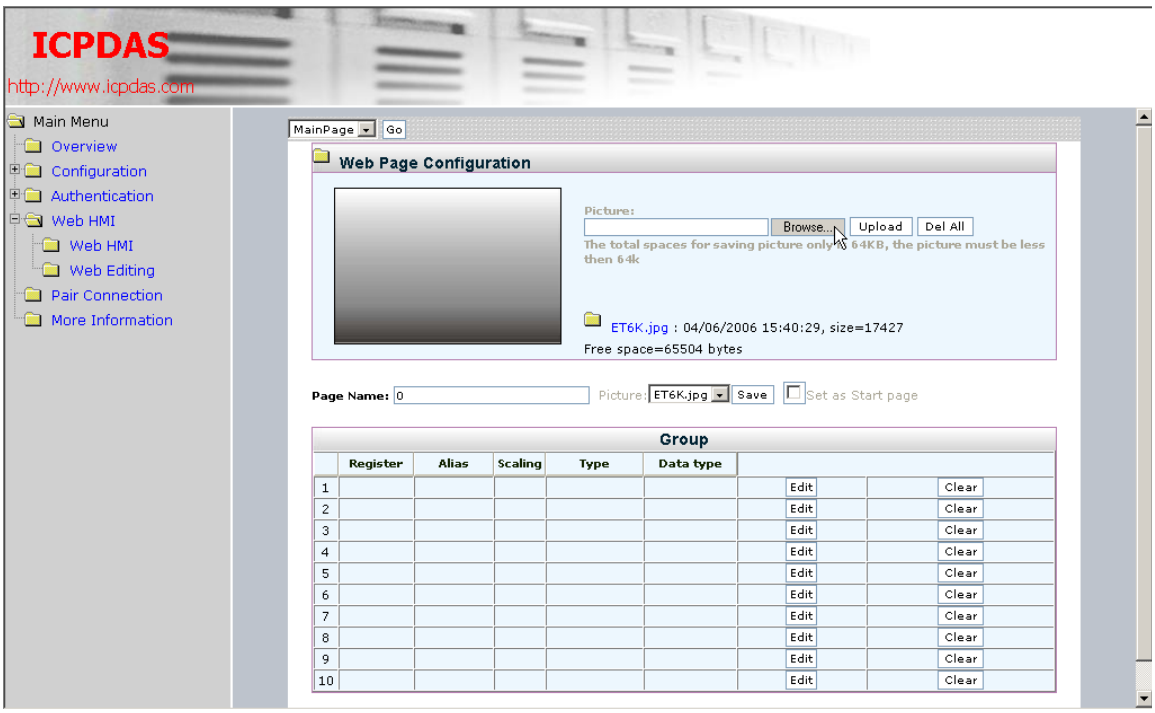
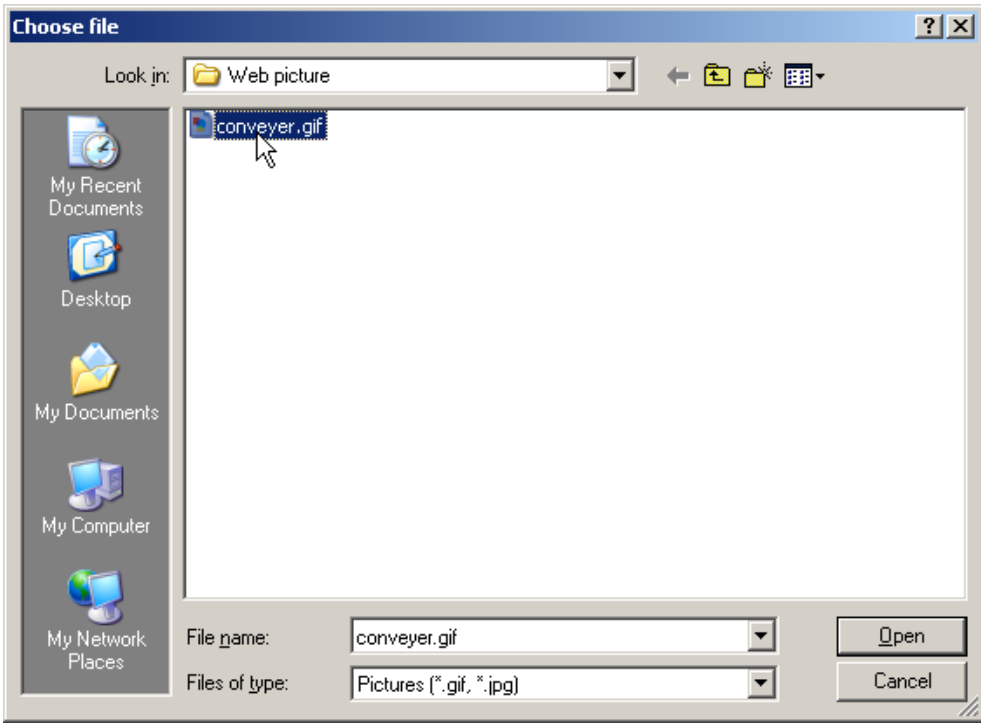
The first going to do is to upload an image file to the ET-7000/PET-7000 module.

Click the “Browse” button to locate the file (.jpg, .gif, .bmp) on your system.



Navigate to the required directory and select the appropriate image file. “conveyer.gif” is selected in this example.

Highlight the file name and Click the “Open” button to make your selection.



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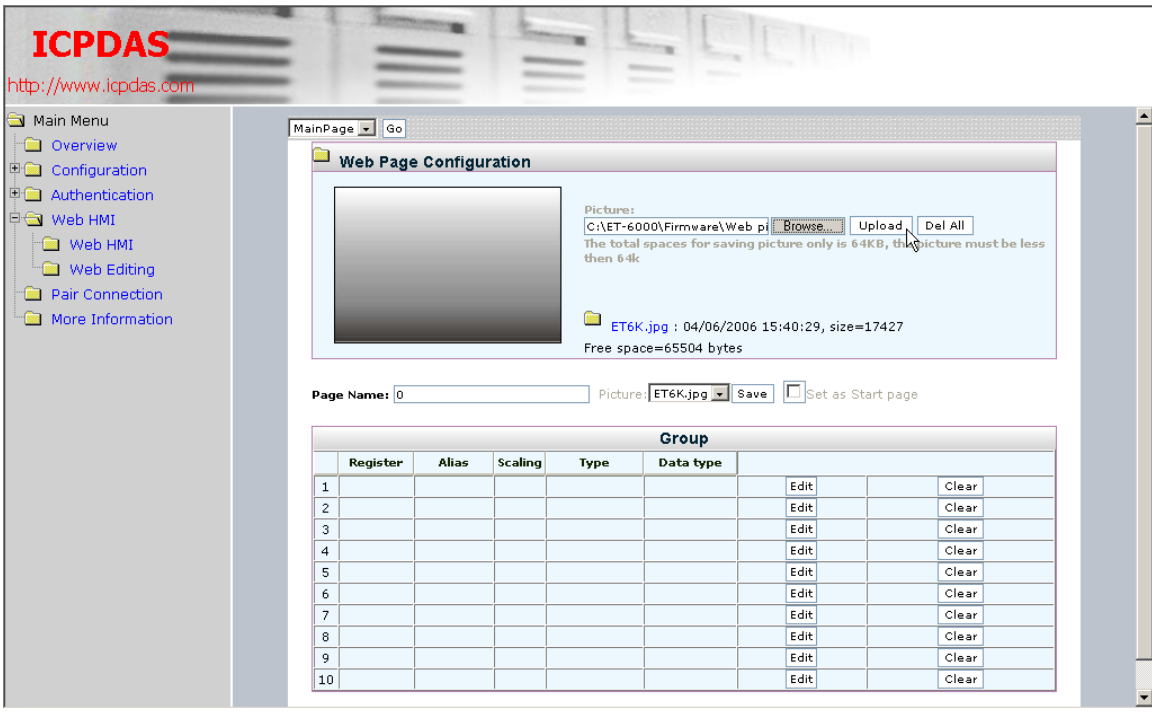
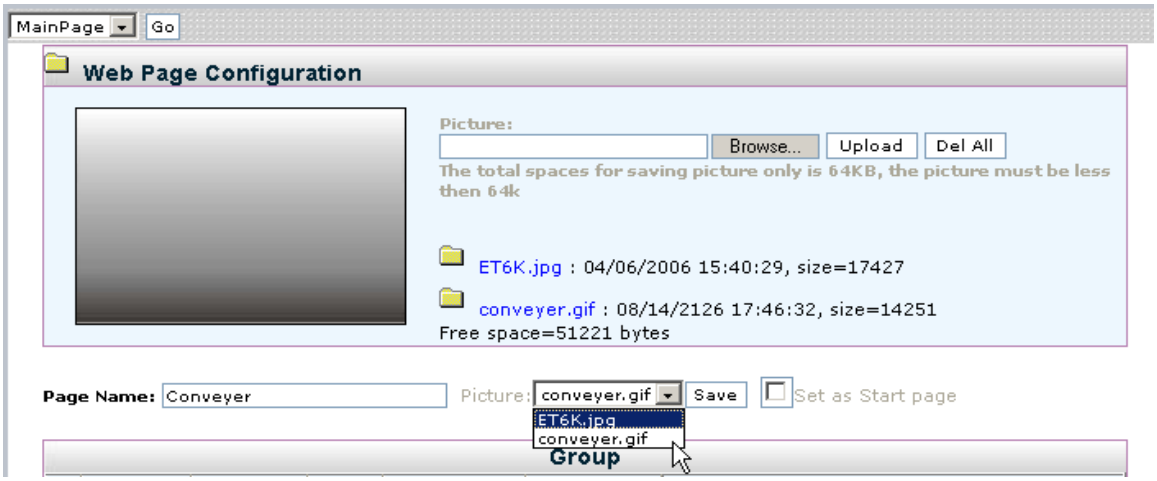
Click the “Upload” button to upload the selected file to the ET-7000/PET-7000 module.



After the upload is completed, the “conveyer.gif” file should now be listed in the file tree and also in the image list box.

1. Enter the page name “Conveyer” to the “Page Name” text field.
2. Select the “conveyer.gif” file from the image list box (the image will be shown in the Preview window)



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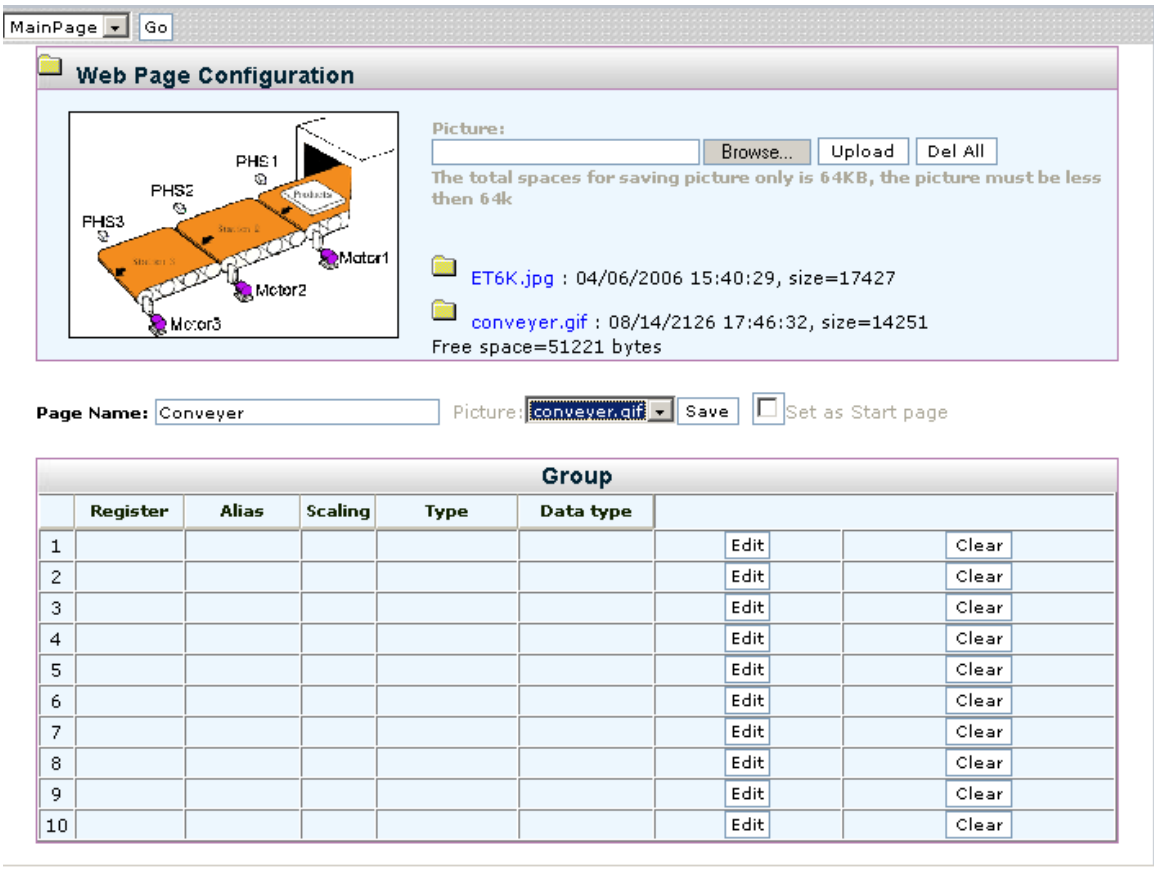
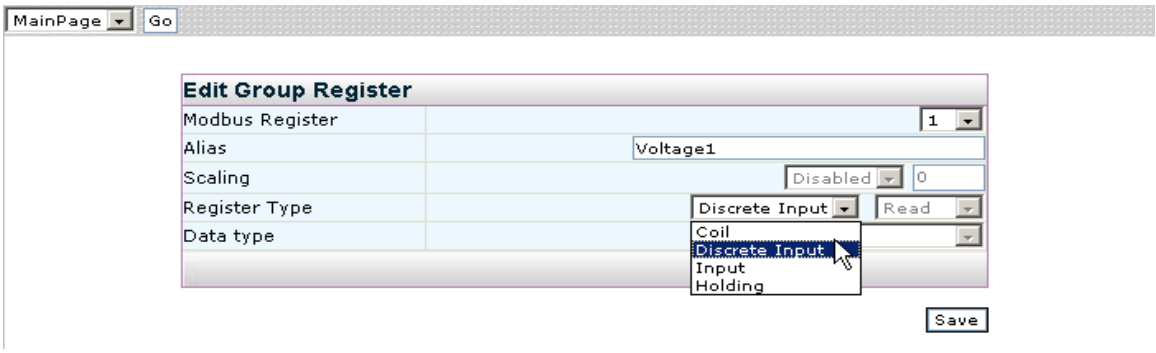


To add a register item, click the Edit button in the first row of the “Group” table and the “Edit Group Register” window will be displayed.

Add a new DI item using the Register Address 1, then select Discrete Input as the register type and enter “PHS1” as the alias. Refer to the following two diagrams as an example, and then Press the Save button to save the information on this page.



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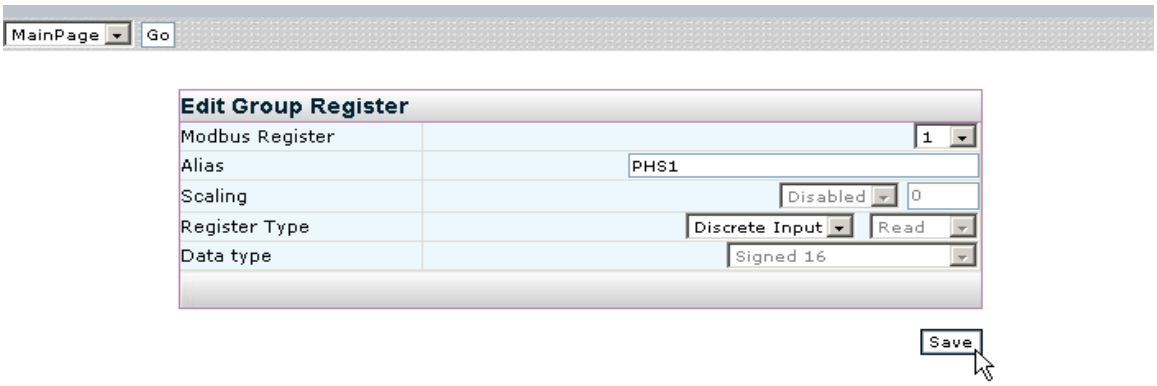
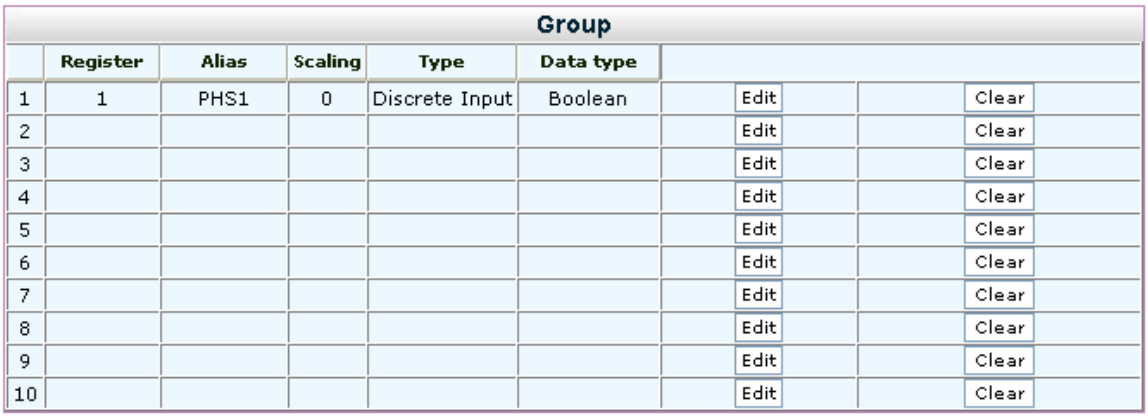


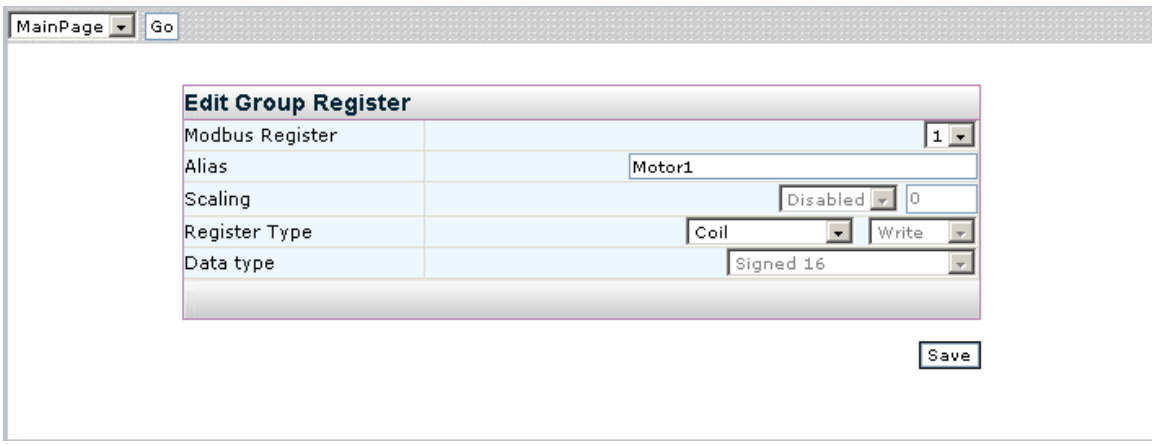
The new register item will now be displayed in the “Group” table.



Group

	Register	Alias	Scaling	Type	Data type		
1	1	PHS1	0	Discrete Input	Boolean	Edit	Clear
2						Edit	Clear
3						Edit	Clear
4						Edit	Clear
5						Edit	Clear
6						Edit	Clear
7						Edit	Clear
8						Edit	Clear
9						Edit	Clear
10						Edit	Clear

Add a DO register item by clicking on the Edit button on the second row of the “group” table then selecting the Register Address 1, select “Coil” as the Register type and enter the alias name “Motor 1”, as shown below.



Repeat the steps above to add the other items, in this example, there are 3 DI items and 3 DO items.

After all required register items have been added, Press button to save this editing page.

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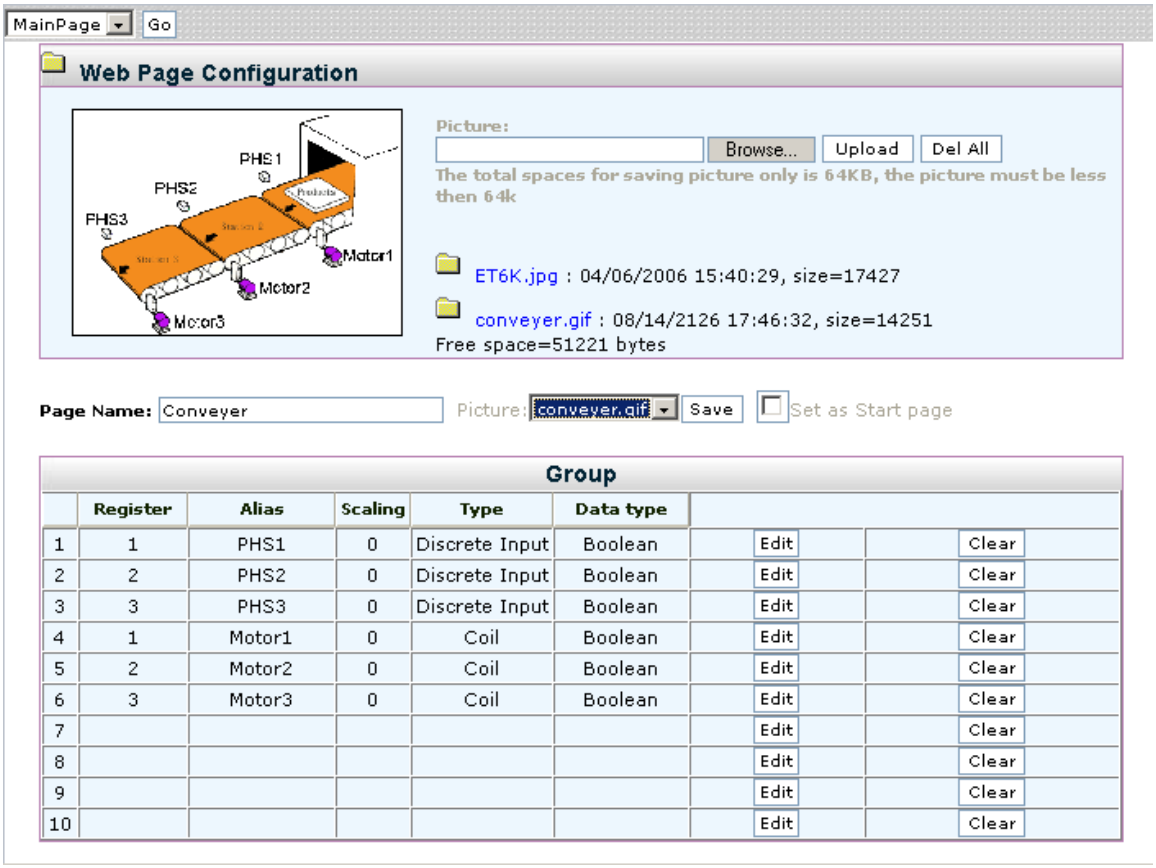

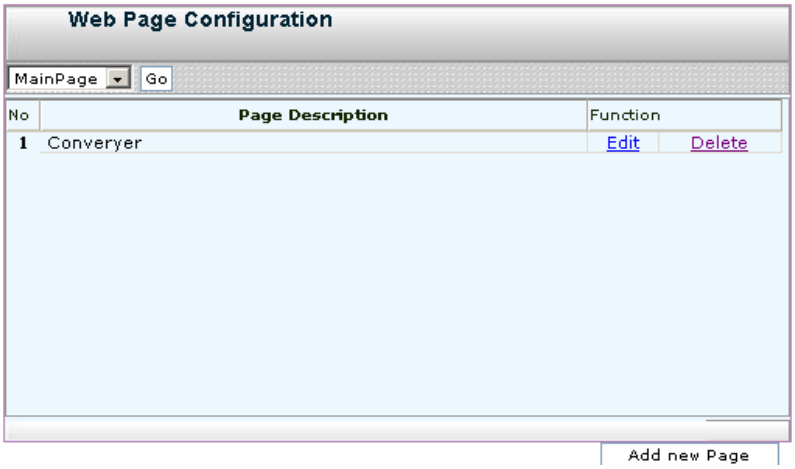

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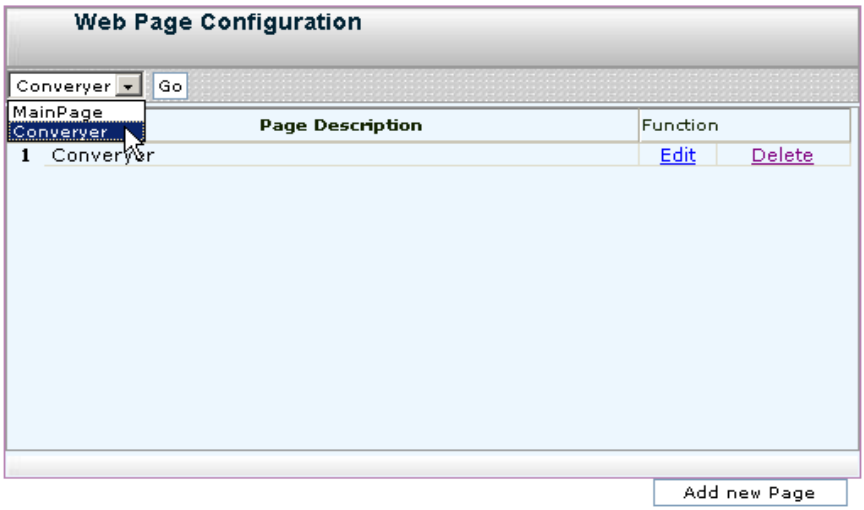
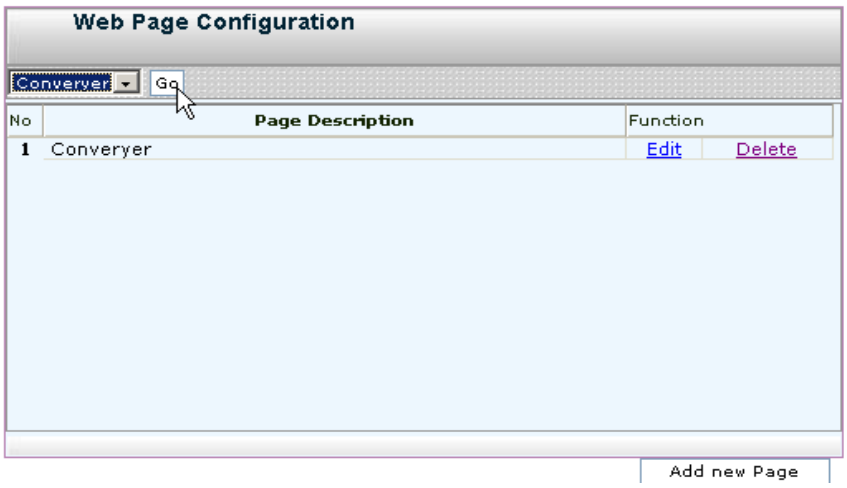
An editing page named as “Conveyer” has added to the list box on the top left-hand side of the “Web Page Configuration” window.

Select the “Conveyer” item and click Go button to browse to the “Conveyer” Web HMI page.





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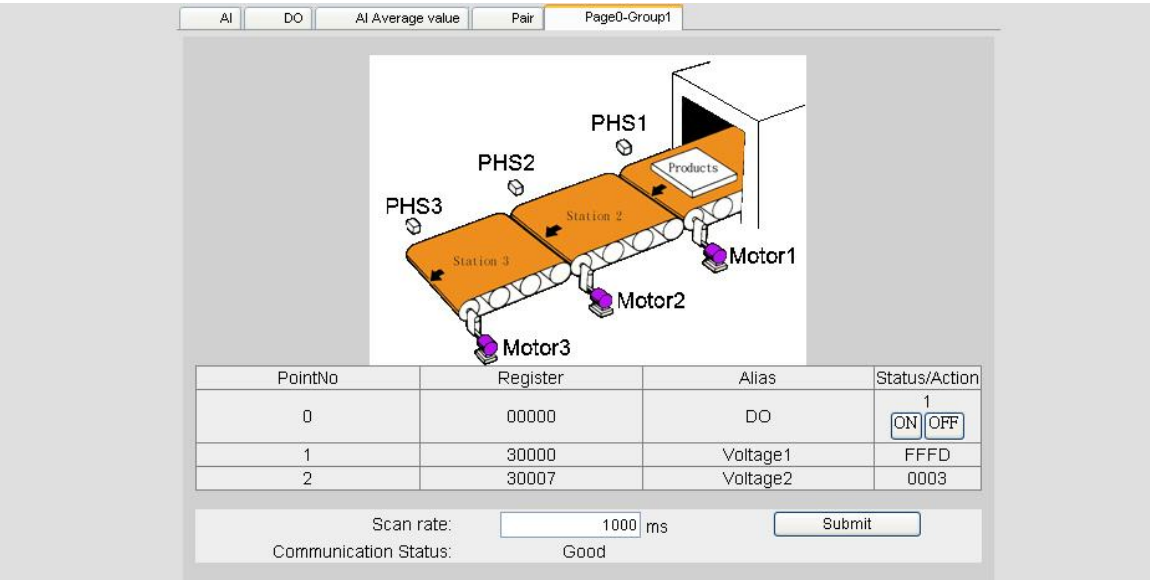
The “conveyer.gif” image file and all register items should be displayed on the “Conveyer” Web HMI page.



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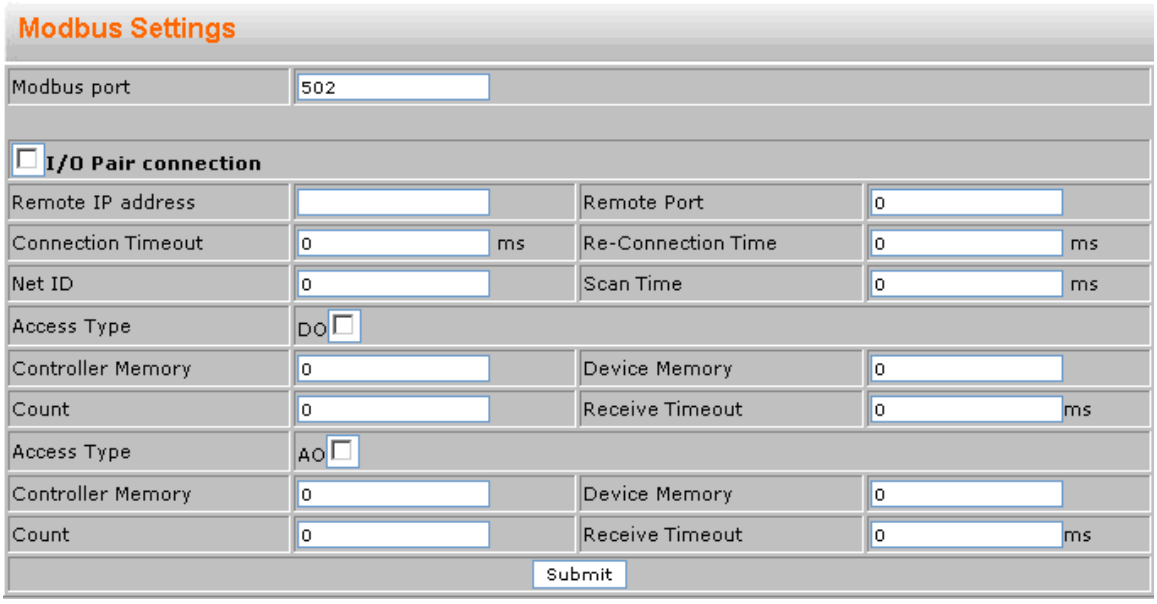
3.5. I/O Pair Connection

The function is used to make a DI to DO pair through the Ethernet. The communication is based on Modbus/TCP. Once the configuration is done, the ET-7000/PET-7000 can poll Remote DI status and then write to a local DO device constantly in the background.



Settings	Description	Range	Default
I/O Pair connection	Enable/Disable I/O pair connection	Enable, Disable	Disable
Remote IP	IP address of remote device	0 ~ 42949672965 ms	0
Remote TCP port	TCP listen port of remote device	0 ~ 65535	502
Remote Net ID	Modbus Net ID of remote device	0 ~ 255	1
Connection timeout	Timeout to build a connection	0 ~ 42949672965	5000 ms
Reconnect interval	Continue to attempt to reconnect to the remote module once the connection is lost until the reconnection time has expired	0 ~ 42949672965 ms	10000 ms

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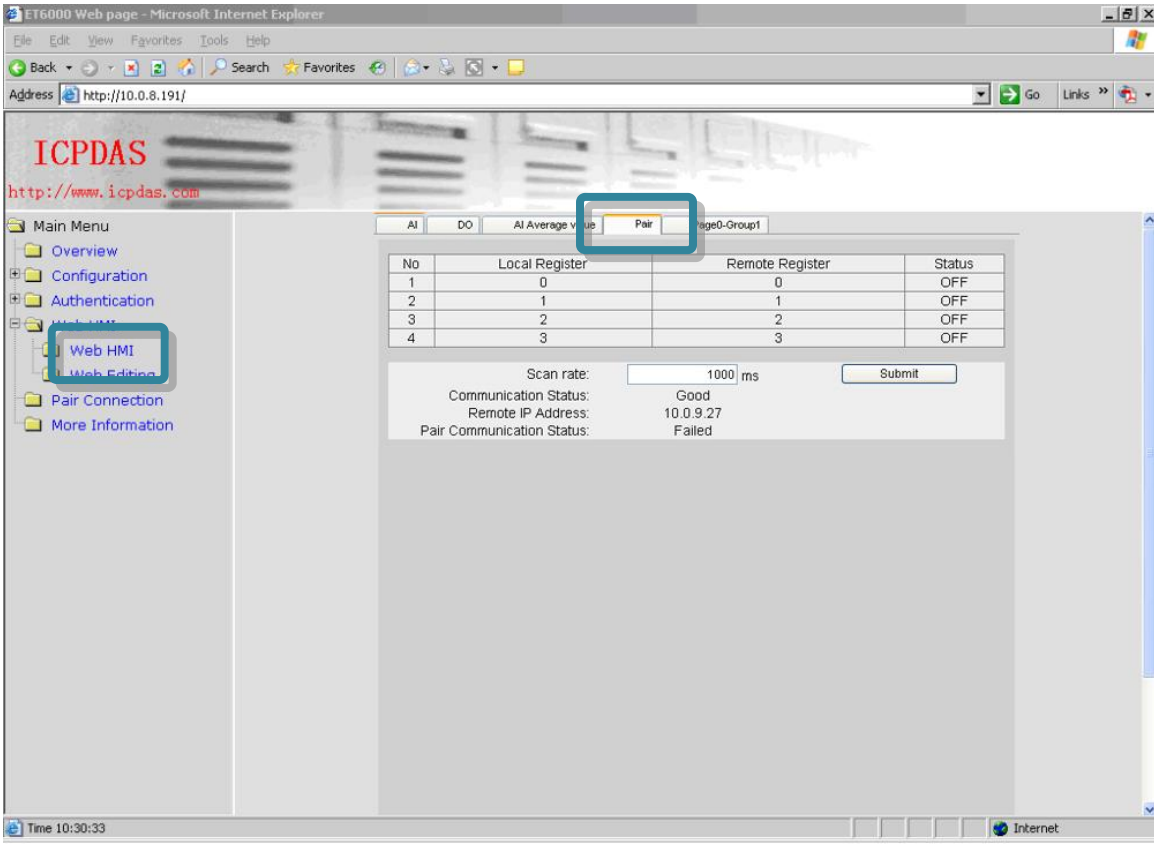
Scan time	Time period to establish the communication	0 ~ 42949672965 ms	1000 ms
Communication timeout	Timeout for Modbus/TCP communication	0 ~ 42949672965 ms	500 ms
Local DI base address	DO base address of local DI register that will be mapped to remote DO device	Depend on the ET-7000/PET-7000	0
Remote DO base address	DO base address of remote DO device that will be mapped to local DI register.	Depend on remote device	0
I/O count	I/O count mapped from the base address	1 ~ 255	0

When the configuration is done, you can click “Pair” from “Web HMI” to open another page to view the pair connection again.



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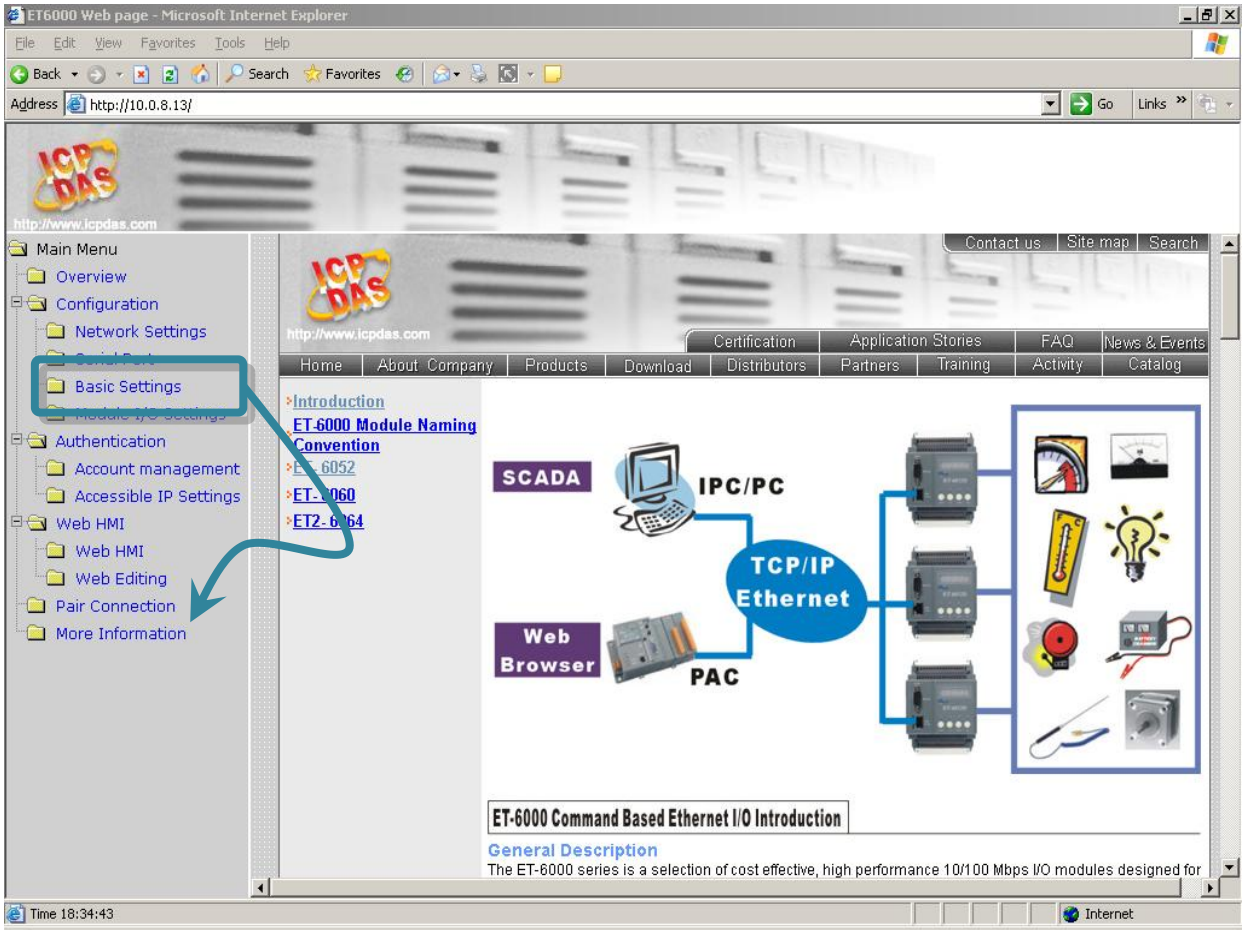
3.6. More Information

The More Information menu item is a Web page URL, and can be used to provide a link to a web site containing additional information about the product maker, detailed specs etc.

The Default More Information URL is:
http://www.icpdas.com/products/Remote_IO/ET-7000/PET-7000/ET-7000/PET-7000_introduction.htm

Please refer to Sec. 3.2.2 Basic Settings for details of how to modify the URL.



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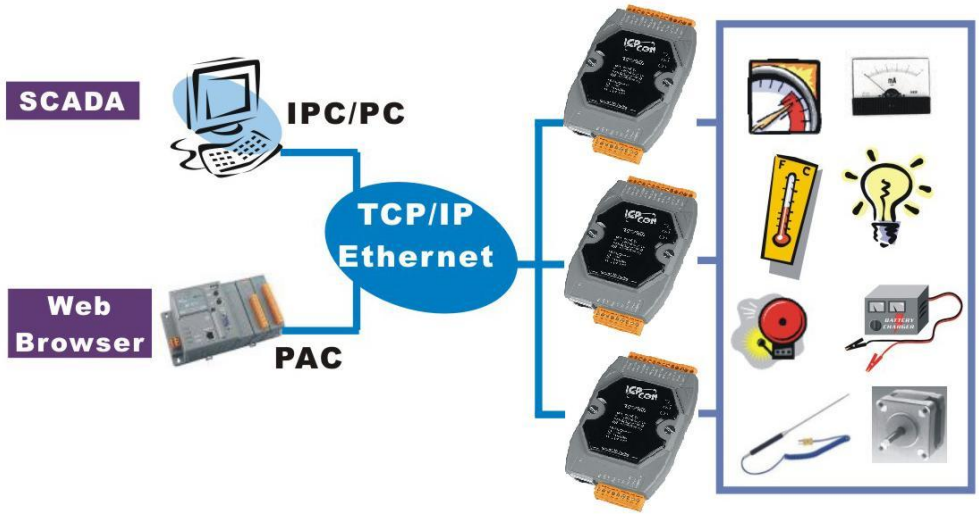
4. How to access ET-7000/PET-7000

ET-7000/PET-7000 series is designed as remote I/O module that can be accessed via an Ethernet interface.

4.1. Via an Ethernet Network

Ethernet is an extremely popular networking format that already exists for most applications, either for use with local networks or for connecting to the Internet. A host PC or other devices on the LAN or WAN can be connected to access the ET-7000/PET-7000 module or control the devices attached on the COM1 of the ET-7000/PET-7000 module.
The Host PC is able to access the ET-7000/PET-7000 module using the Modbus/TCP.



Modbus/TCP Protocol

The Modbus/TCP protocol is a variant of the standard Modbus protocol. It was developed in 1999 to allow access to Ethernet devices by Internet community.

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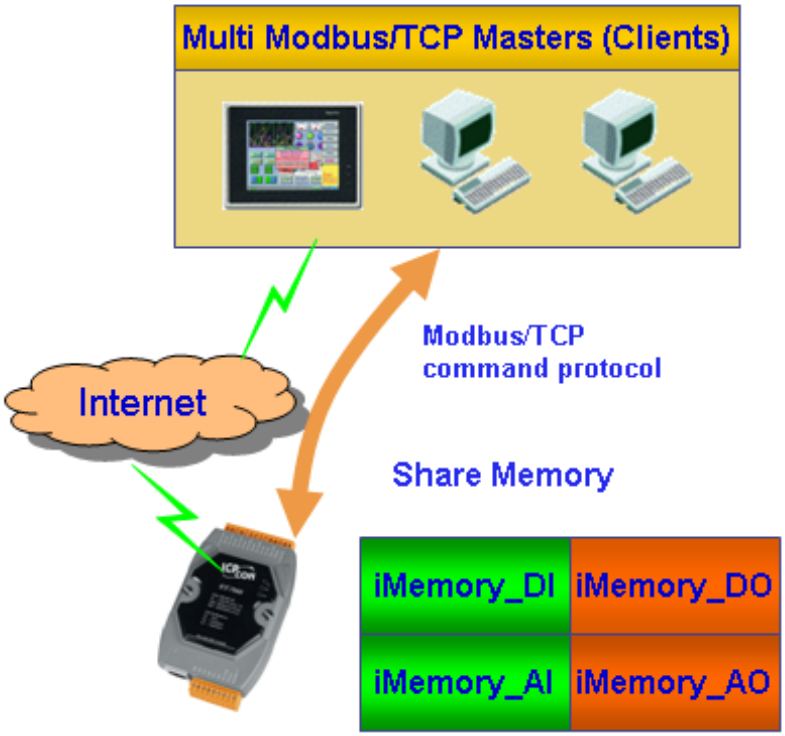
4.2. Using the Modbus Protocol

MODBUS is a master-slave bus system in which only one device (the master) actively starts a transaction (query). The passive device (the slave) then sends a response. Most SCADA Supervisor Control And Data Acuisition and HMI software can easily integrate serial devices via the Modbus protocol, such as Citect, ICONICS, iFIX, InduSoft, Intouch, Entivity Studio, Entivity Live, Entivity VLC, Trace Mode, Wizcon, Wonderware, etc.

The ET-7000/PET-7000 controller includes the Modbus/TCP protocol, which is a variation of the Modbus protocol that was developed in 1999 to allow the Internet community to access Ethernet devices.

Modbus address for Modbus/TCP client access.



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4.2.1. Function codes supported

Modbus function codes are different both the analog and digital types.

Modbus Command (Hex)	Protocol Description
01	Read multiple coils status for DO
02	Read multiple input discrete for DI
03	Read multiple registers for AO
04	Read multiple input registers for AI
05	Write single coil for DO
06	Write single register for AO
0F	Force multiple coils for DO
10	Write multiple registers for AO

4.2.2. Modbus register address table

In addition to the Web Configuration Page, the custom's software that supports Modbus protocol can be used to issue Modbus command to the ET-7000/PET-7000 module.

For more details regarding the Modbus address of the ET-7000/PET-7000 module, please refer to Appendix C: Modbus Register Table.

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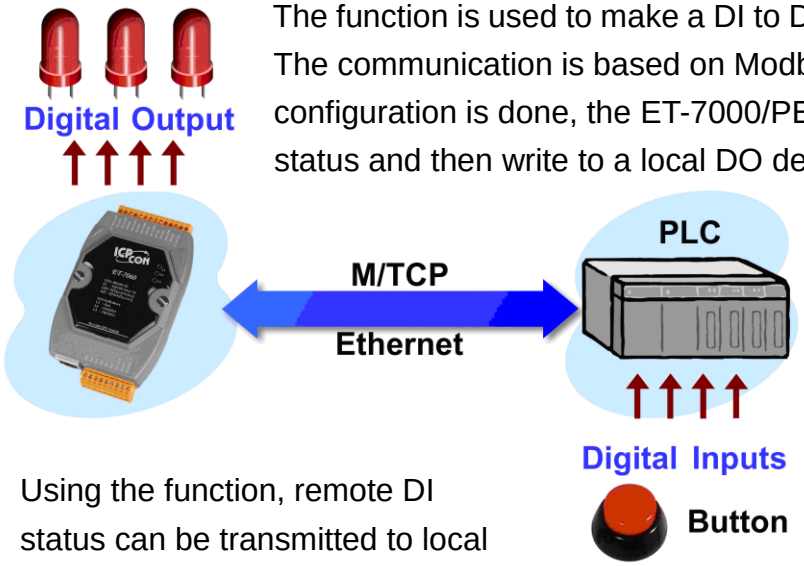
5. I/O Pair Connection



The function is used to make a DI to DO pair through the Ethernet. The communication is based on Modbus/TCP. Once the configuration is done, the ET-7000/PET-7000 can poll remote DI status and then write to a local DO device constantly in the background.

Using the function, remote DI status can be transmitted to local DO device over the Ethernet without any programming skill.

Please refer to Sec. 3.5 Pair Connection for more details regarding the configuration of the I/O pair connection

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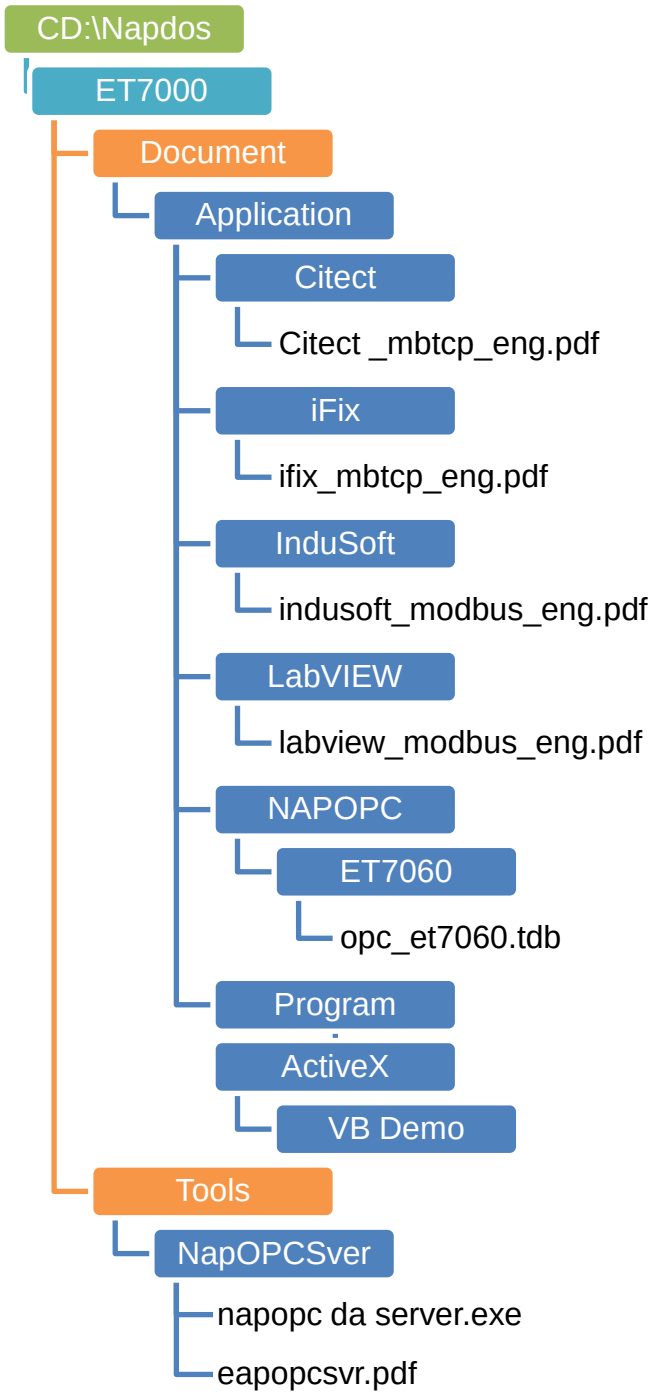
6. Software Development Application

The following diagram illustrates the location of all documents and software related to Modbus applications for ET-7000/PET-7000 series modules. The relevant file can quickly be located by referring to the diagram.



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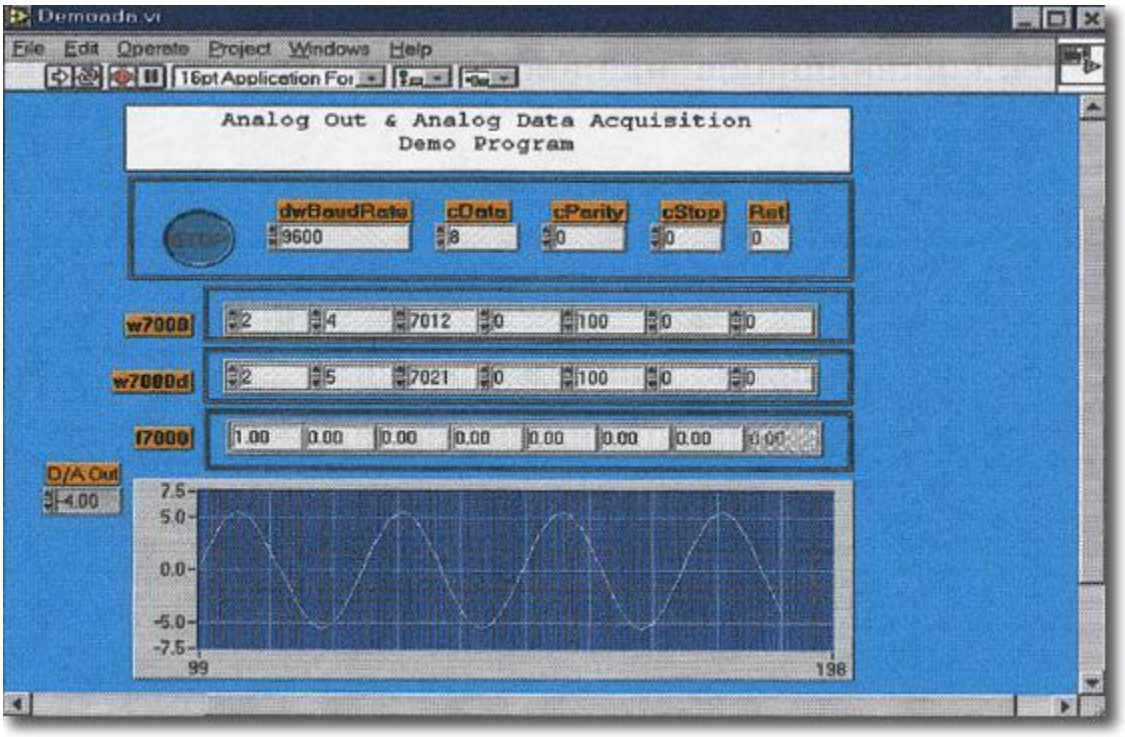
6.1. LabVIEW



LabVIEW is the best way to acquire, analyze, and present data. LabVIEW delivers a graphical development environment that can be used to quickly build data acquisition quickly, instrumentation and control systems, boosting productivity and saving development time. With LabVIEW, it is possible to quickly create user interfaces that enable interactive control of software systems. To specify your system functionality, simply assemble block diagram – a natural design notation for scientists and engineers.

The document containing the detailed instructions for linking to the ET-7000/PET-7000 using the Modbus protocol is located on the shipped CD: \NAPDOS\ET7000\Document\Application\LabVIEW or ftp://ftp.icpdas.com/pub/cd/6000cd/napdos/et7000/document/application/labview

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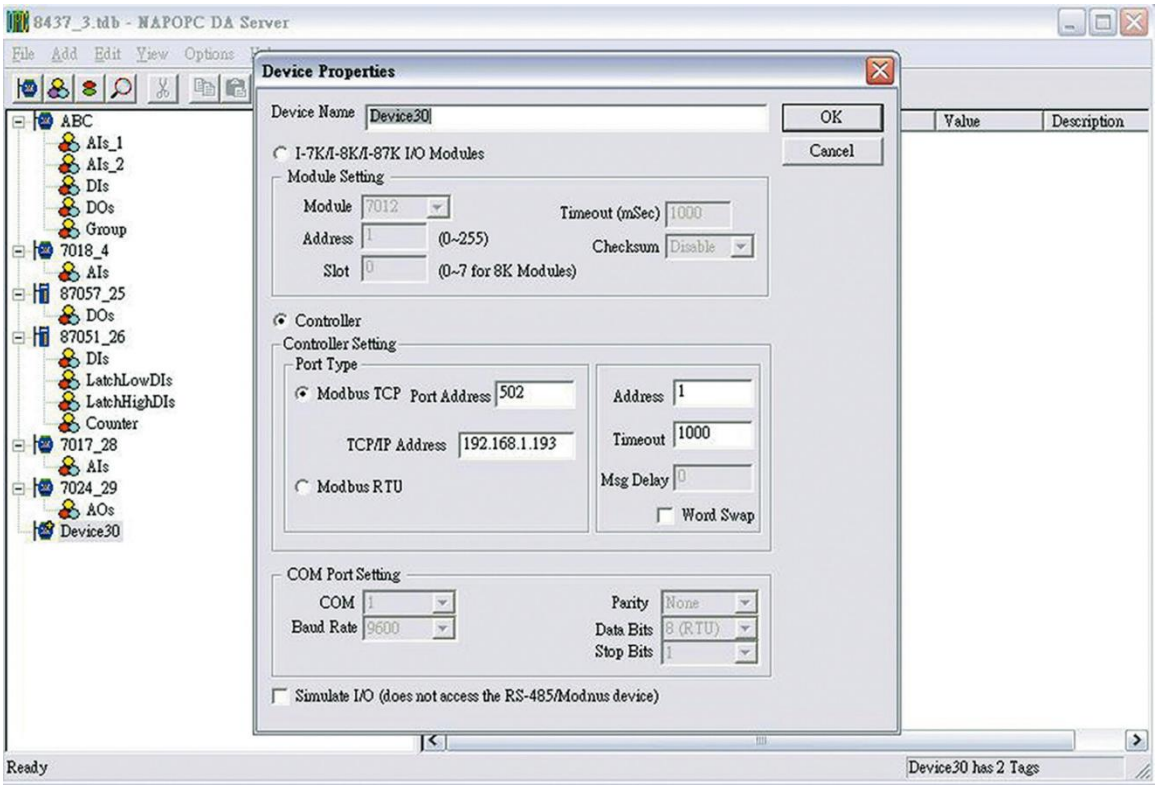
6.2. OPC Server



OPC (OLE for Process Control) is the first standard resulting from the collaboration of a number of leading worldwide automation suppliers working in cooperation with Microsoft. Originally based on Microsoft's OLE COM (Component Object Model) and DCOM (Distributed Component Object Model) technologies, the specification defines a standard set of objects, interfaces and methods for use in process control and manufacturing automation applications to facilitate interoperability.

There are many different mechanisms provided by various vendors that allow access to a variety of devices via specific applications. However, if an OPC server is provided for the device, other applications will be able to access the OPC Server via the OPC interface.

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Procedure for using the OPC server

Step 1: Read the following documents

Readme.txt: contains the latest important information, including:

- A list of files contained on the shipped CD

Reversion.txt: contains the revision history information, including

- Bugs
- New modules supported

Step 2: Install the OPC server by executing:
CD:\NAPDOS\ET7000\Tools\Napopcsvr\NapOPCServer.exe

Tips & Warnings

If there is an older version of the Nap OPC Server installed on the PC, and must be uninstalled before installing the new version.

Step 3: Read the manuals describing how to begin.

The NapOPCSvr.pdf is the user's manual describing how to use the OPC server

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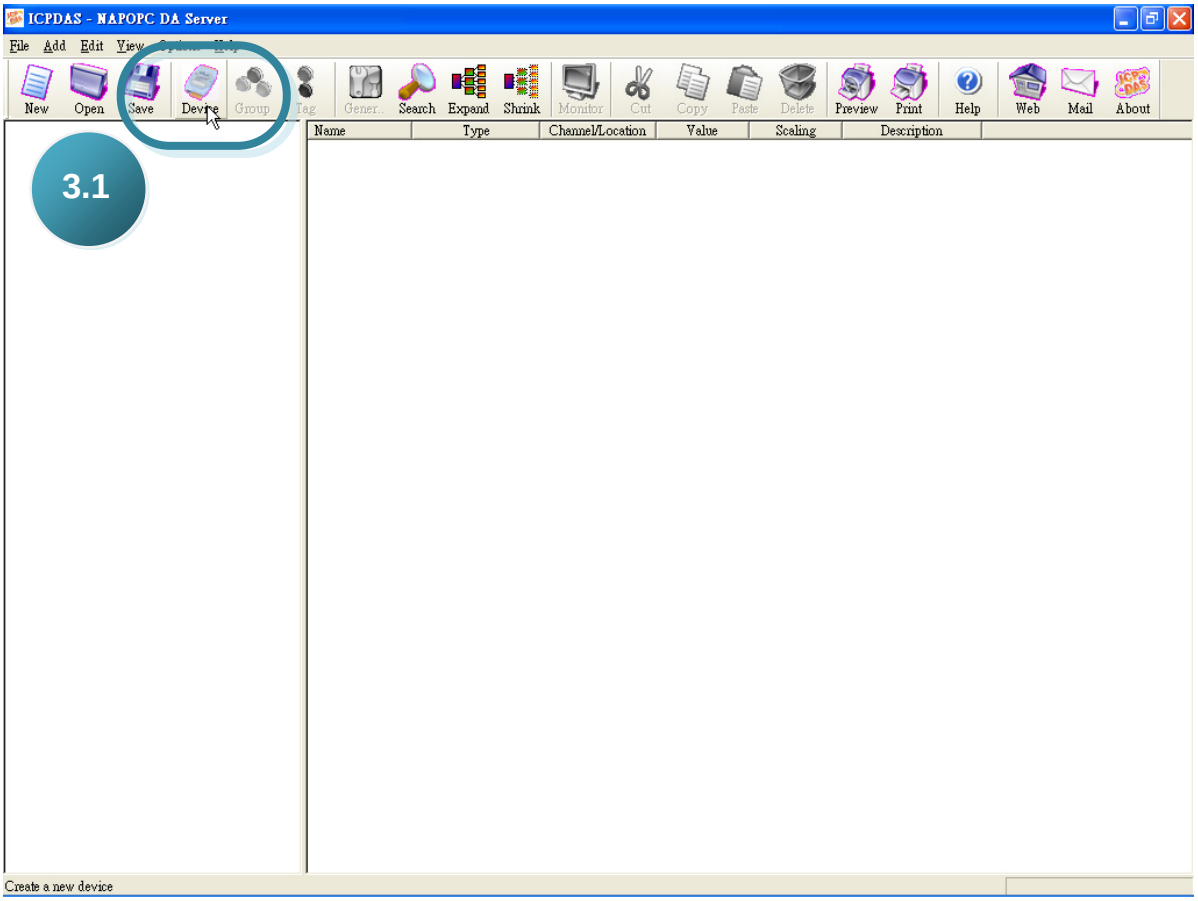
OPC Server example using Modbus protocol

The following is an example of accessing Digital input and output values from an ET-7000/PET-7000

Step 1: Connect the ET-7000/PET-7000 controller (refer to Sec. 1.5.2) and configure its network settings (IP, Mask and Gateway - refer to Sec. 2.1)

Step 2: Run the OPC server

Step 3: Add/Create a new device and to search for I/O modules using Modbus /TCP protocol


ICPDAS - NAPOPC DA Server
File Add Edit View
New Open Save Device Group Tag Gener.. Search Expand Shrink Monitor Cut Copy Paste Delete Preview Print Help Web Mail About
Name Type Channel/Location Value Scaling Description
3.1
Create a new device

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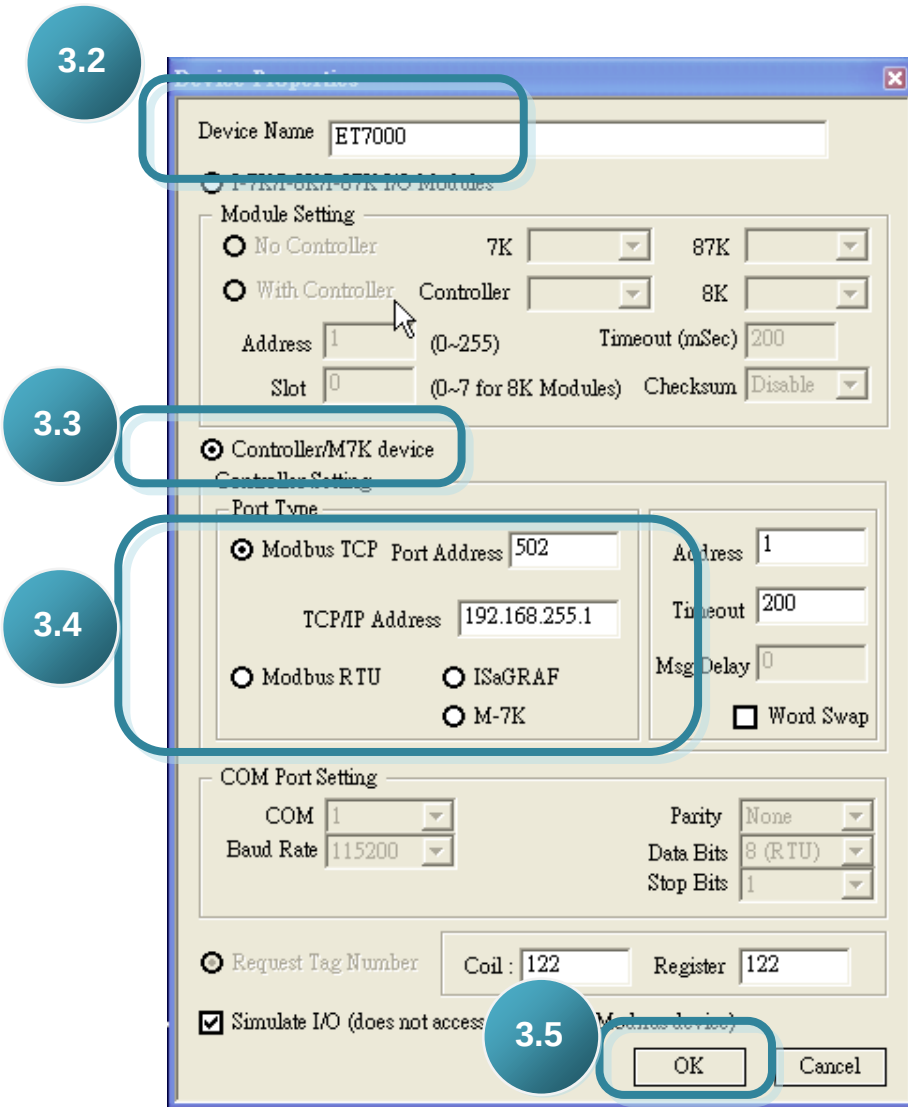
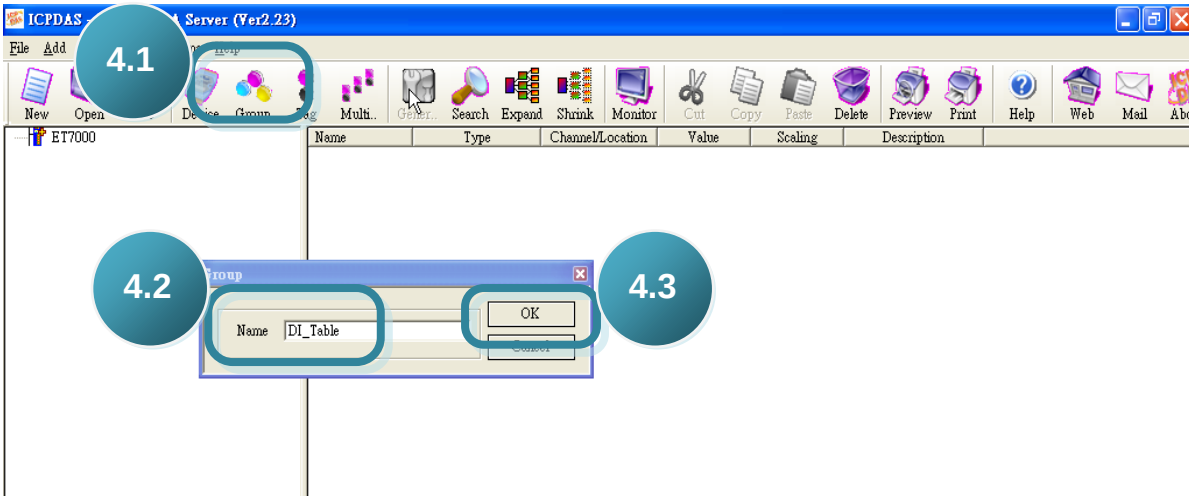


Step 4: New a Group and Tag



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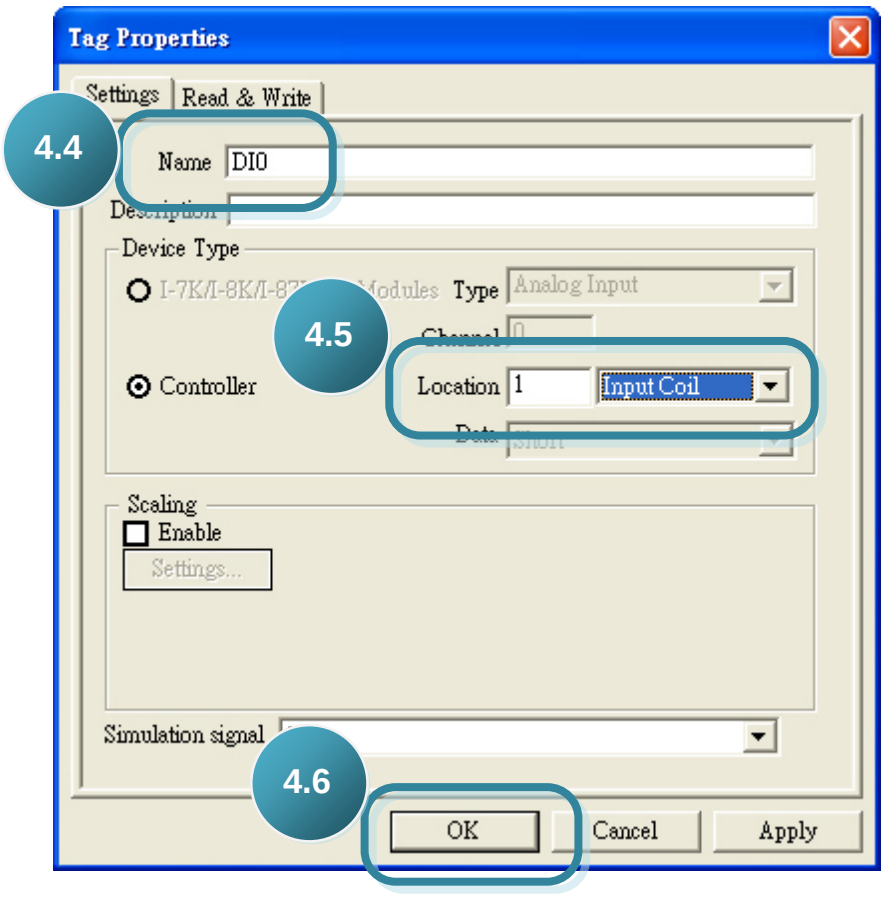

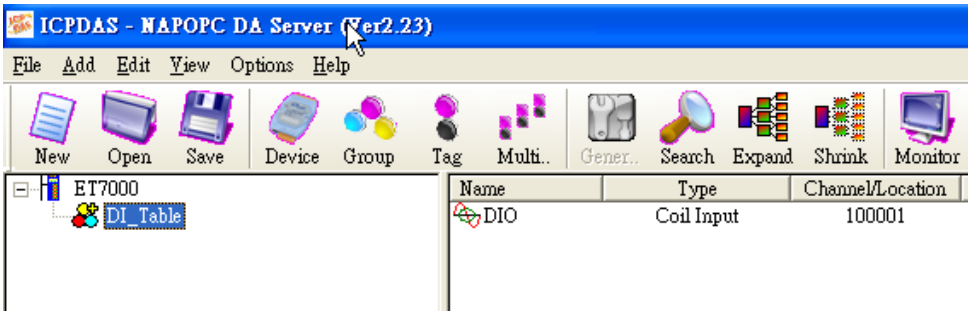

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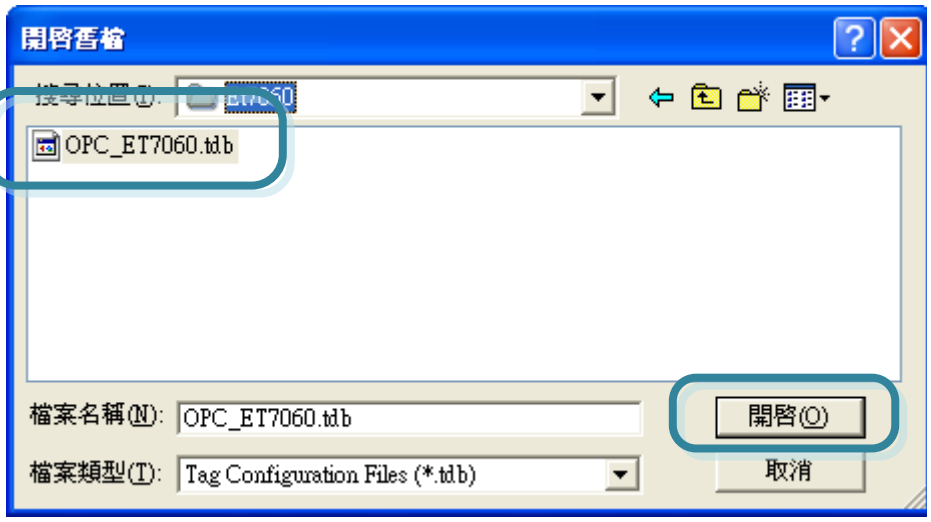
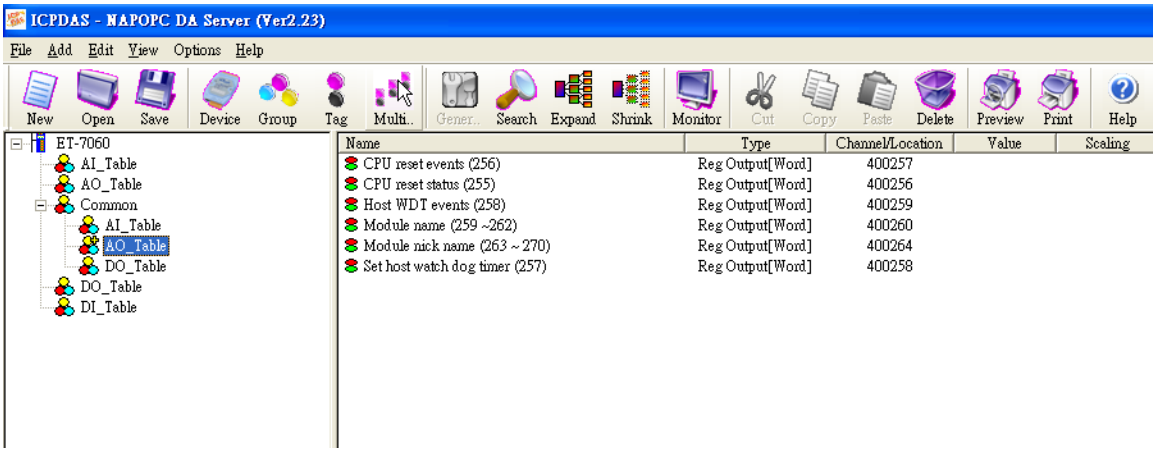
Step 5: Load a finished OPC project file for ET-7060




ICPDAS - NAPOPC DA Server (Ver2.23)
File Add Edit View Options Help
New Open Save Device Group Tag Multi.. Gener.. Search Expand Shrink Monitor Cut Copy Paste Delete Preview Print Help
ET-7060
AI_Table
AO_Table
Common
AI_Table
AO_Table
DO_Table
DO_Table
DI_Table
Name Type Channel/Location Value Scaling
CPU reset events (256) Reg Output[Word] 400257
CPU reset status (255) Reg Output[Word] 400256
Host WDT events (258) Reg Output[Word] 400259
Module name (259 ~262) Reg Output[Word] 400260
Module nick name (263 ~ 270) Reg Output[Word] 400264
Set host watch dog timer (257) Reg Output[Word] 400258

Tips & Warnings

The OPC file for the ET-7060 is located at:
CD:\NAPDOS\ET7000\Document\Application\NAPOPC\ET-7060

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6.3. SCADA

SCADA stands for Supervisor Control and Data Acquisition. It is a production automation and control system based on PCs
SCADA is wildly used in many fields e.g. power generation, water systems, the oil industry, chemistry, the automobile industry. Different fields require different functions, but they all have the common features:

✓ Graphic interface
✓ Process mimicking
✓ Real time and historic trend data
✓ Alarm system
✓ Data acquisition and recording
✓ Data analysis
✓ Report generator

Accessing ET-7000/PET-7000 module

SCADA software is able to access ET-7000/PET-7000 devices using Modbus communication protocols, and can communicate without the need for other software drivers.

Famous SCADA software

Citect, ICONICS, iFIX, InduSoft, Intouch, Entivity Studio, Entivity Live, Entivity VLC, Trace Mode, Wizcon, Wonderware ... etc
In the following sections 3 popular brands of SCADA software are introduced together with the detailed instructions in how use them to communicate with ET-7000/PET-7000 series module using the Modbus/TCP protocol.

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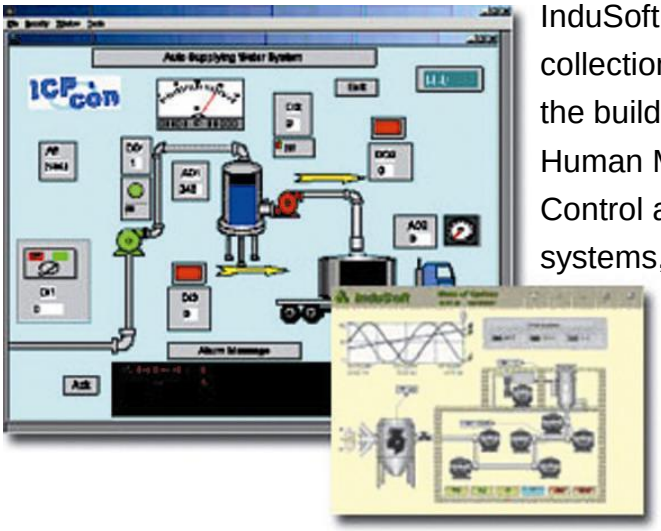
6.3.1. InduSoft



InduSoft Web Studio is a powerful, integrated collection of automation tools that includes all the building blocks needed to develop modern Human Machine Interfaces (HMI), Supervisory Control and Data Acquisition (SCADA) systems, and embedded instrumentation and control applications. InduSoft Web Studio's application runs in native Windows NT, 2000, XP, CE and CE .NET environments and conforms to industry standards such as Microsoft .NET, OPC, DDE, ODBC, XML, and ActiveX.

The document containing detailed instructions for linking to the ET-7000/PET-7000 module using the Modbus protocol is located on the shipped CD:\NAPDOS\ET7000\Document\Application\InduSoft\
ftp://ftp.icpdas.com/pub/cd/6000cd/napdos/et7000/document/application/indusoft/

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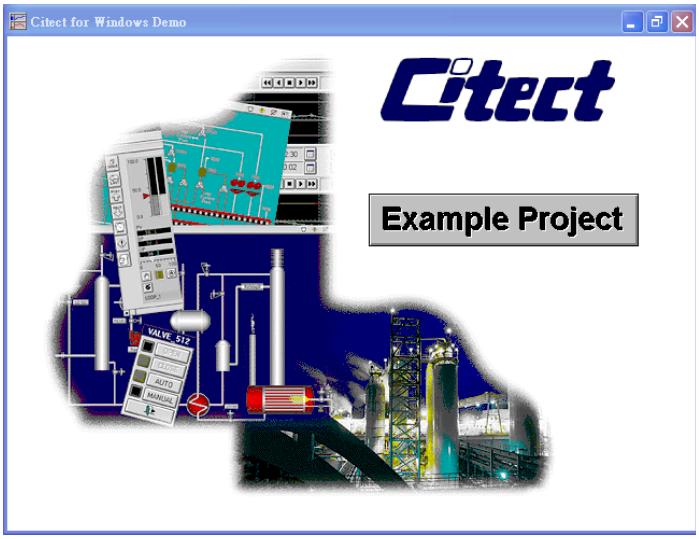
6.3.2. Citect



CitectSCADA is a fully integrated Human Machine Interface (HMI) / SCADA solution that enables users to increase return on assets by delivering a highly scalable, reliable control and monitoring system. Easy-to-use configuration tools and powerful features enable rapid development and deployment of solutions for any size application.

The document containing detailed instructions for linking to the ET-7000/PET-7000 module using the Modbus protocol is located on the shipped CD:\NAPDOS\ET7000\Document\Application\Citect\
ftp://ftp.icpdas.com/pub/cd/6000cd/napdos/et7000/document/application/citect/

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6.3.3. iFix

The document containing detailed instructions for linking to the ET-7000/PET-7000 module using the Modbus protocol is located on the shipped CD:\NAPDOS\ET7000\Document\Application\iFix\
ftp://ftp.icpdas.com/pub/cd/6000cd/napdos/et7000/document/application/ifix/

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7. Troubleshooting

A number of common problems are easy to diagnose and fix if you know the cause.

Symptom/Problem	Possible cause	Solution
The Run LED doesn't light	Internal power has failed	Return the module for repair.
The Run LED indicator is ON (light), but not flashing.	The module has possibly crashed.	Reboot the module
Cannot communicate via the Ethernet port, but the ET-7000/PET-7000 is still operating.	The IP/Mask/Gateway address isn't within the IP address range of the LAN.	Change the IP/Mask/Gateway address to match the LAN, or ask the MIS administrator for assistance.
	The IP address has restricted by the IP filter settings	Check the IP filter setting using the Web configuration.
	There are more than 30 TCP/IP connections.	Reboot the module.
Able to explore the web page through port 80 using a web browser, but the Web HMI and Modbus/TCP program cannot access the module through port 502.	Port 502 has been restricted by the firewall.	Consult your MIS administrator for assistance.
The Web HMI and Modbus/TCP program can access the module through port 502, but Web browser cannot explore the web page through port 80 using a web browser.	The Port 502 has restricted by the firewall.	Consult your MIS administrator for assistance.
	The Web Configuration function has been disabled. (Shown on the Basic Settings page)	Enable the Web Configuration function using either the SMMI or the console.
	The Web server TCP port has been changed from port 80 (Shown on the Basic Settings page)	Change the TCP port to 80 or reconnect the ET-7000/PET-7000 using the specific TCP port.

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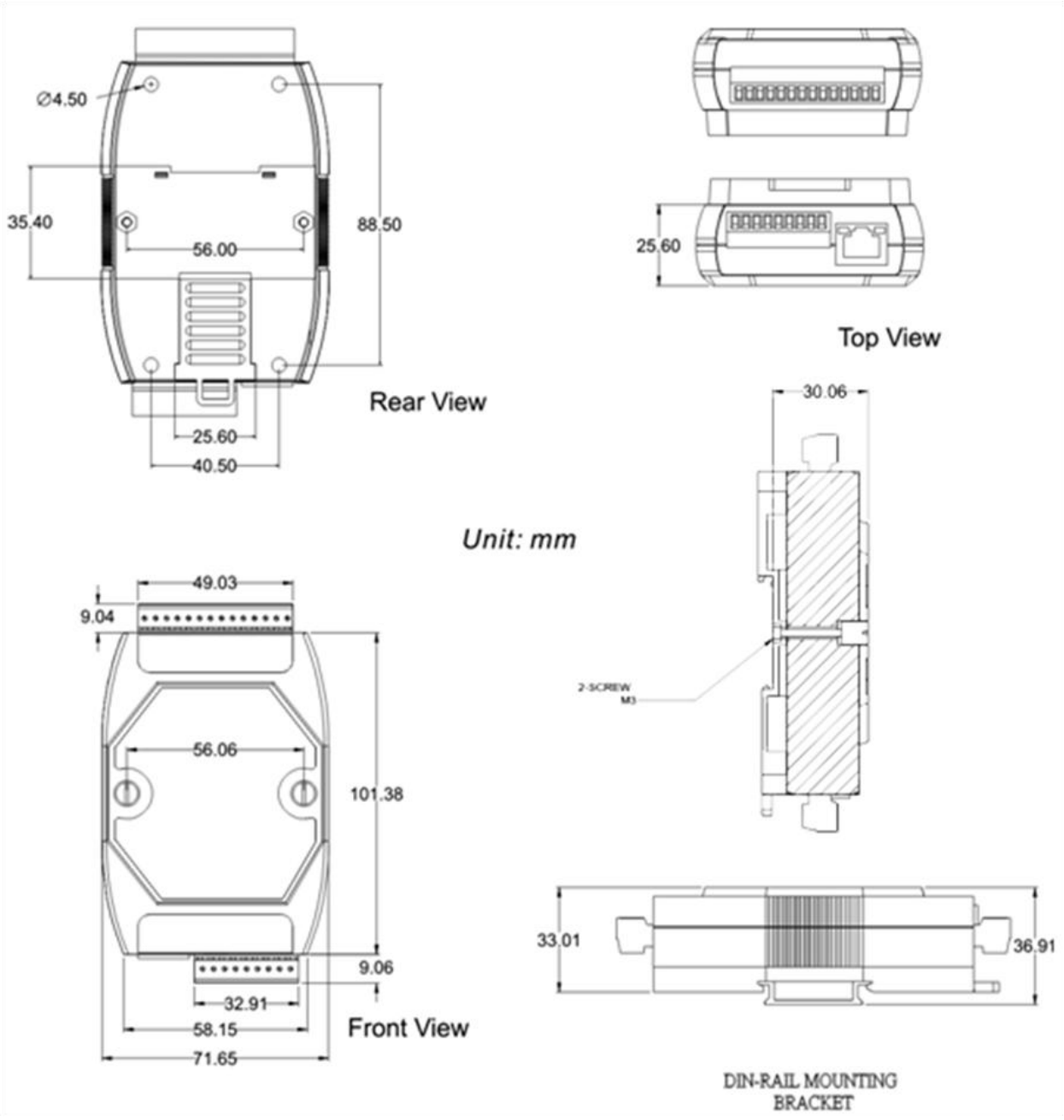
Appendix A. Dimensions

All dimensions are in millimeters.



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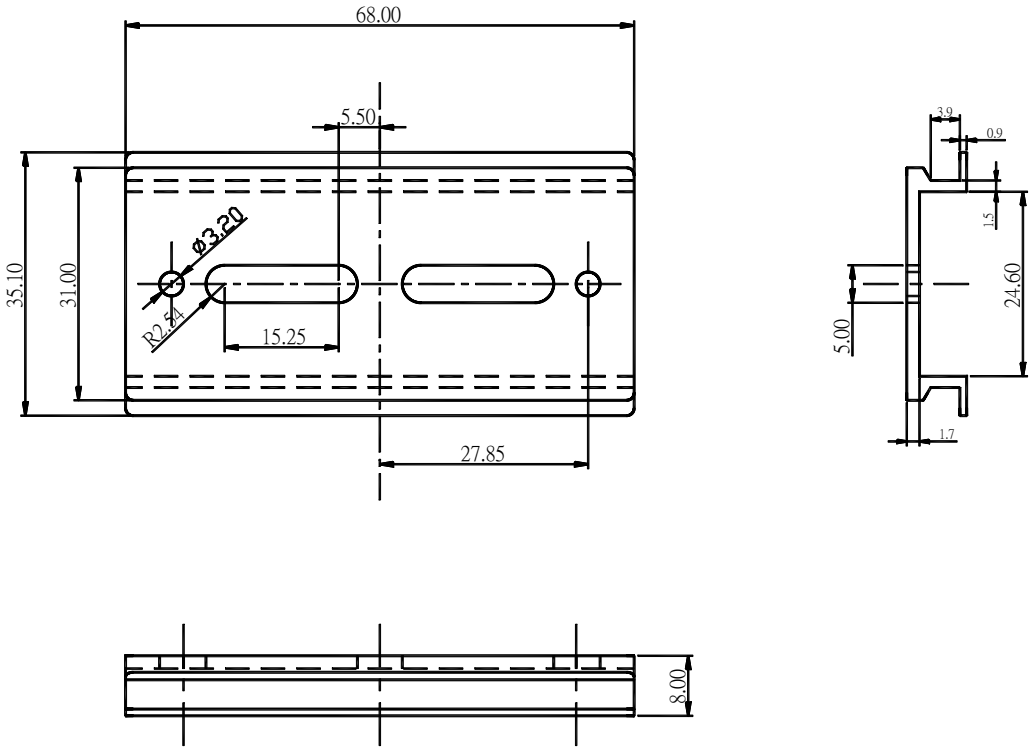
Wall Mount Bracket



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Appendix B. MiniOS7 Utility

On occasions, ICPDAS will offer an update to the ET-7000/PET-7000 firmware or MiniOS7. The MiniOS7 utility is used to easily update your software to the latest version. The MiniOS7 Utility is used for both essential configuration and for downloading programs into the ET-7000/PET-7000 controller embedded in the ICPDAS MiniOS7 environment.

The MiniOS7 Utility program provides 3 main functions:

- Update the MiniOS7 image
- Download firmware to Flash memory
- Configure Ethernet and COM port settings

The location of the MiniOS7 Utility

The MiniOS7 utility is located on the

- **Companion CD:**
  CD:\NAPDOS\ET7000\Tools\Tools for MiniOS7\MiniOS7_utility
- **ICP DAS FTP:**
  ftp://ftp.icpdas.com/pub/cd/6000cd/napdos/et7000/tools/tools

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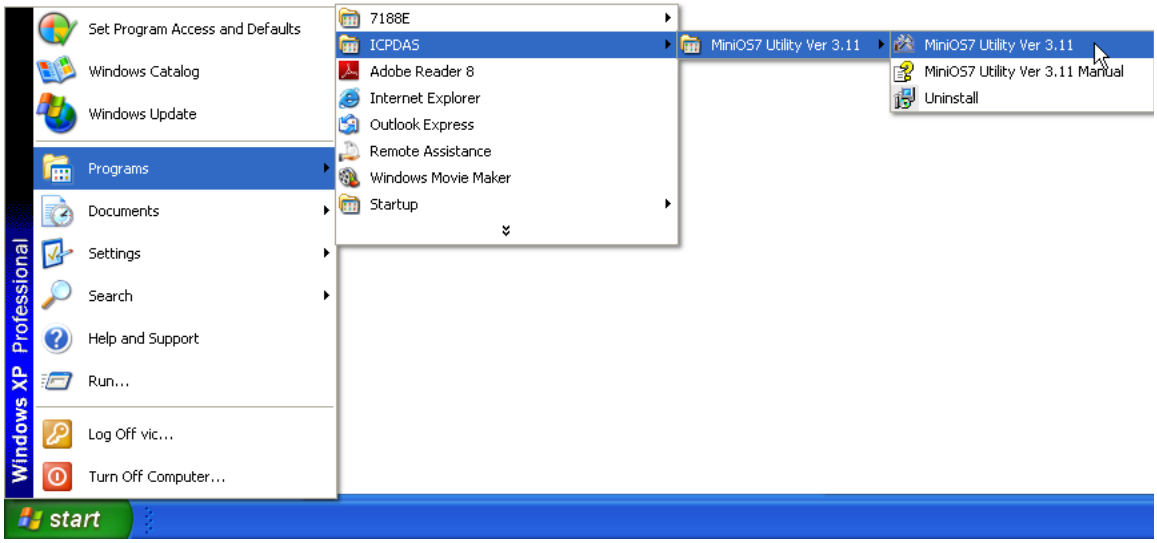
Installation procedure

Step 1: Locate and run MiniOS7utility.exe from the CD:\NAPDOS\ET7000\Tools\Tools for MiniOS7\MiniOS7_utility directory.

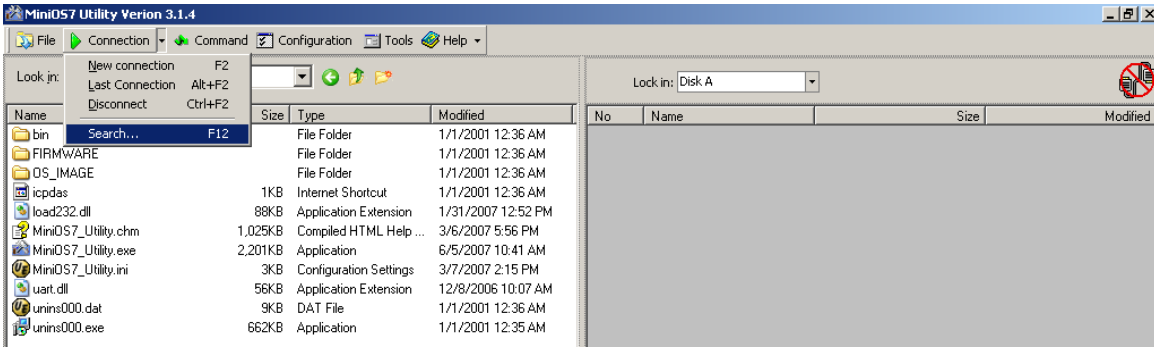
Step 2: After completing the installation, a new “ICPDAS” folder will be added to the “programs” section of the start menu. The MiniOS7_utility files can be accessed by clicking on this folder and then the 'MiniOS7 utility' folder. See the diagram below for details.



Downloading firmware to the ET-7000/PET-7000 module

Step 1: From the Windows START menu, navigate to programs/ICPDAS/MiniOS7 Utility and locate the MiniOS7 utility' program.

Step 2: Click Search item on the Connect item of man menu.


MiniOS7 Utility Verion 3.1.4
File
Connection
Command
Configuration
Tools
Help
New connection F2
Last Connection Alt+F2
Disconnect Ctrl+F2
Search... F12
Look in:
Lock in: Disk A
Name Size Type Modified
bin File Folder 1/1/2001 12:36 AM
FIRMWARE File Folder 1/1/2001 12:36 AM
OS_IMAGE File Folder 1/1/2001 12:36 AM
icpdas 1KB Internet Shortcut 1/1/2001 12:36 AM
load232.dll 88KB Application Extension 1/31/2007 12:52 PM
MiniOS7_Utility.chm 1,025KB Compiled HTML Help ... 3/6/2007 5:56 PM
MiniOS7_Utility.exe 2,201KB Application 6/5/2007 10:41 AM
MiniOS7_Utility.ini 3KB Configuration Settings 3/7/2007 2:15 PM
uart.dll 56KB Application Extension 12/8/2006 10:07 AM
unins000.dat 9KB DAT File 1/1/2001 12:36 AM
unins000.exe 662KB Application 1/1/2001 12:35 AM
No Name Size Modified

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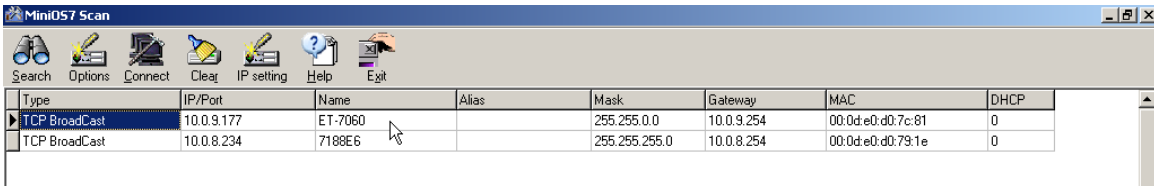
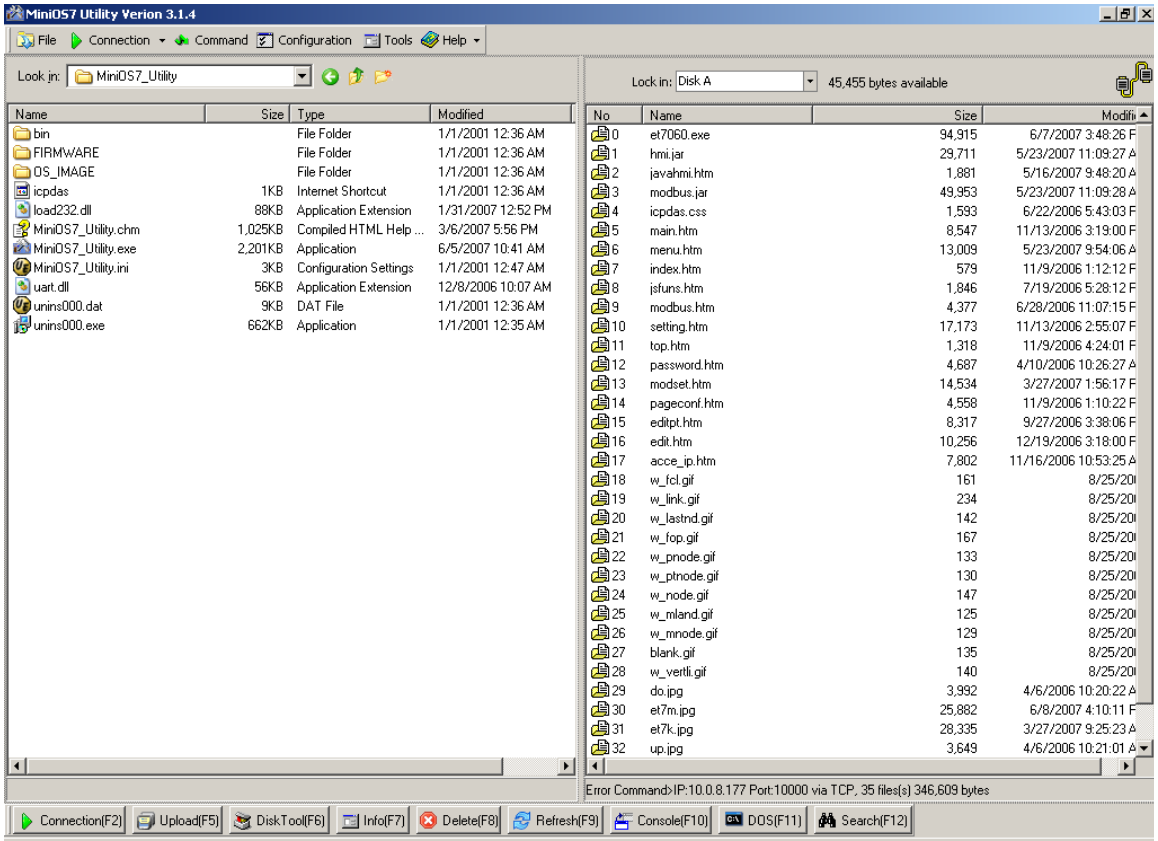
Step 3: Double click the ET-7000/PET-7000 that you want to configure.



Step 4: After a connection between the ET-7000/PET-7000 and PC has been successfully established, the following screen will be displayed. (The total files on the selected ET-7000/PET-7000 shows on the file list of right hand window)



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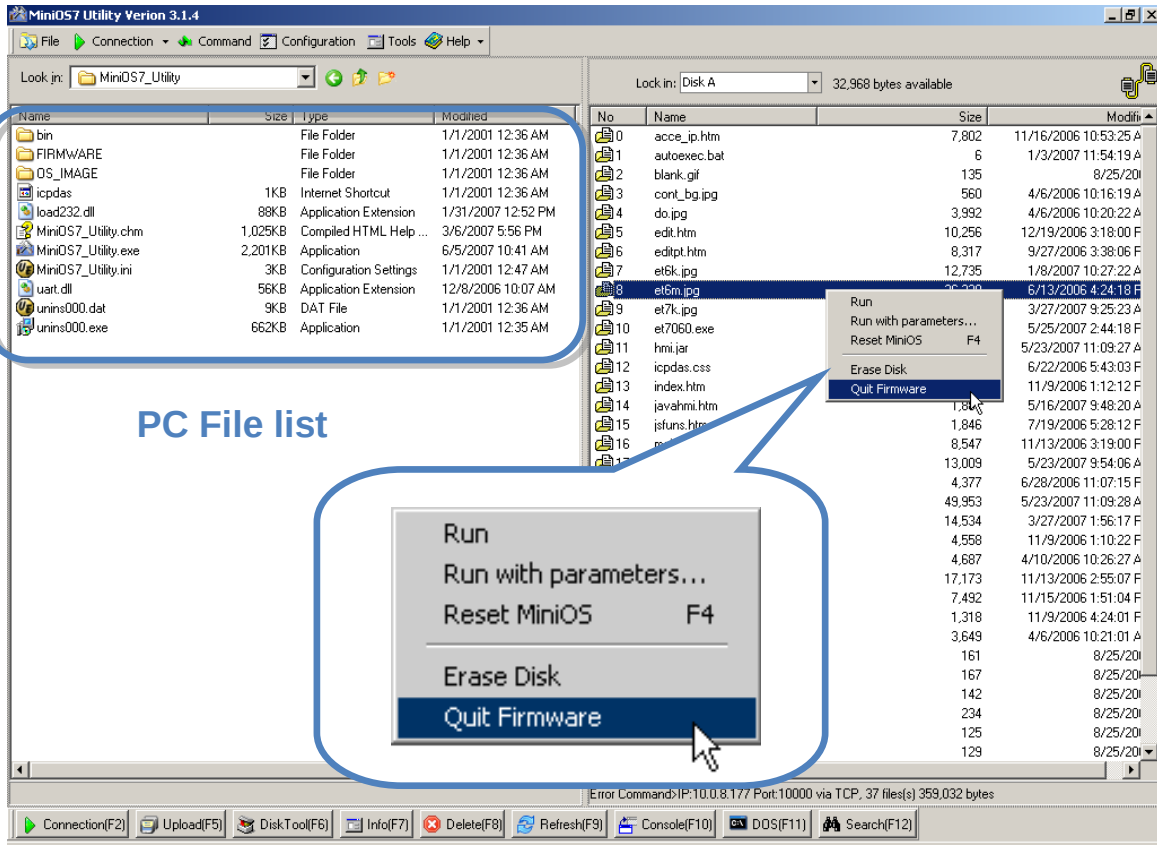
Step 5: Right Click the file list on the right hand window and then click Quit Firmware item from TCP/IP mode to UDP mode.

Tips & Warnings

The default firmware of ET-7000/PET-7000 series module is TCP/IP mode that uses the TCP/IP protocol for communication. The Modbus/TCP protocol or Web communication are constructed on this communication layer.

The UDP mode is used to update the firmware and MiniOS7 image.



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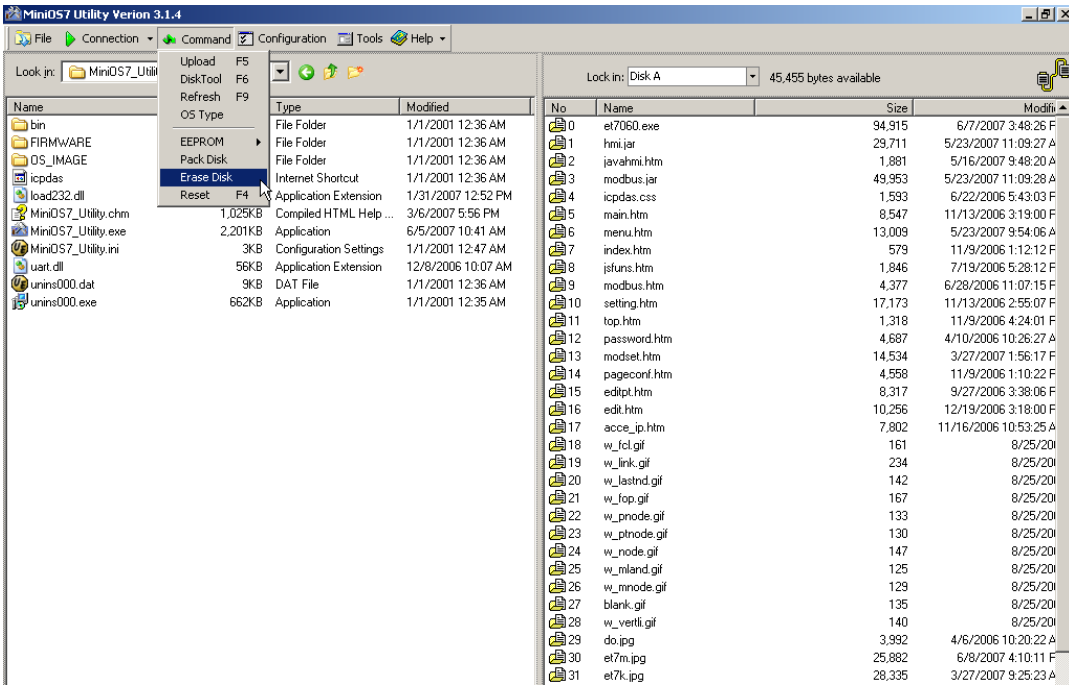
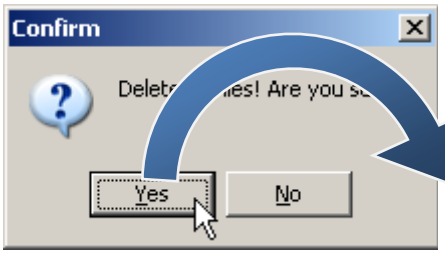
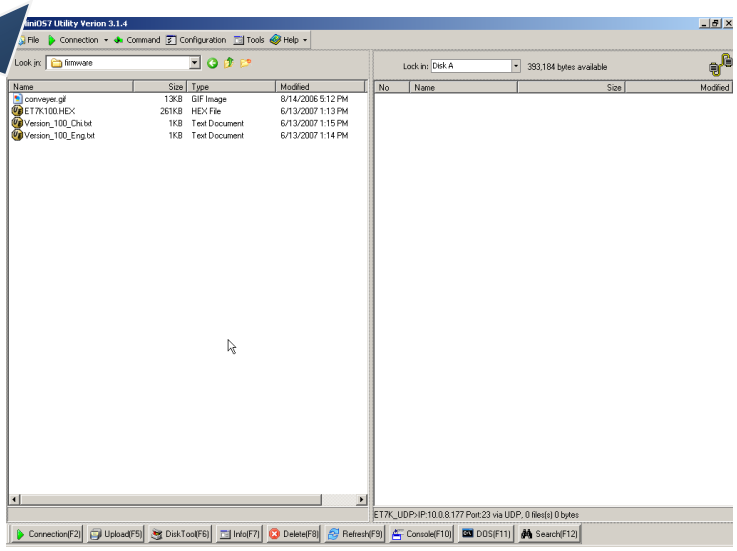
Step 6: Click Erase Disk item of Command item of main menu



Step 7: A Confirm dialog notices whether all files will be deleted or not



If Press “Yes” button, all files on ET-7000/PET-7000 will be deleted. Please refer to the picture below.



Tips & Warnings

Before updating the firmware, you must delete all files existed on the ET-7000/PET-7000.

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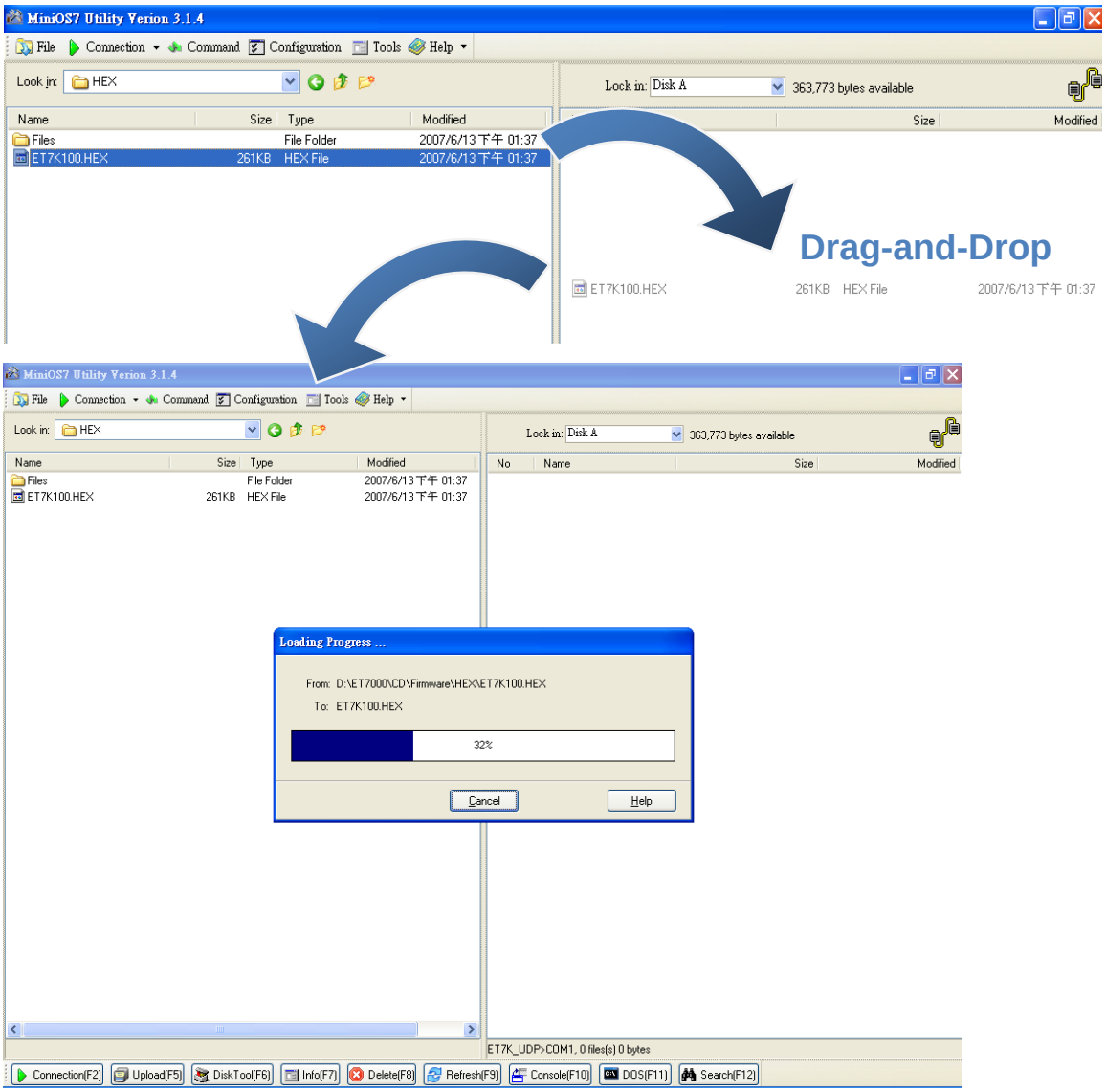
Step 8: Locate the required file in the left hand window, then drag and drop this file to the ET-7000/PET-7000. The figure below shows that the ET-7000/PET-7000 firmware has been downloaded to the ET-7000/PET-7000 module.

Tips & Warnings

The ET-7000/PET-7000 firmware is a file named ET7Knnn.HEX, where 'nnn' is the version number.

The MiniOS7 utility is only a tool for the ET-7000/PET-7000 series module to update its firmware, and the version of MiniOS7 utility must be V3.14 or later



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Tips & Warnings

To select multiple files, press and hold the CTRL or SHIFT keys while making your/a selection and drag them to simultaneously download the files to ET-7000/PET-7000

After completing the download, turn off the power to the ET-7000/PET-7000 and then turn it back ON. This will cause the program to begin running the autoexec.bat (the content of the autoexec.bat indicates which file in the ET-7000/PET-7000 will run after rebooting). Alternatively, click the button to execute it.

Please refer to the MiniOS7 utility help file for more details regarding the use of the MiniOS7 utility. This file is located in the ICPDAS MiniOS7_utility group in the 'Start' menu, or can be accessed by clicking the icon at the top of the MiniOS7 Utility toolbar.

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Appendix C. Modbus Register Tables

Modules Supported (ET-7000/PET-7000 series)			
Name	**Date**	**Firmware**	**Note**
ET-7015/ PET-7015	Apr 2009	V1.01	7-ch RTD input
ET-7017/ PET-7017	Jan 2009	V1.10	4-ch DO and 8-ch AI
ET-7017-10	Jan 2009	V1.10	10-ch differential or 20-ch single-ended AI
ET-7018Z/ PET-7018Z	Apr 2009	V1.02	10-ch differential and 6-ch DO

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C.1. Common Functions for all ET-7000/PET-7000 series modules

- **(0xxxx) DO address**

Begin address	Points	Description	Registers per Point	Range	Access Type
226	1	Recover all I/O default settings	1	1=recover	W (Pulse)
233	1	Reboot ET-7000/PET-7000	1	1=reboot	W (Pulse)

- **(3xxxx) AI address**

Begin address	Points	Description	Registers per Point	Range	Access Type
350	1	OS image version	1	123 (hex) means version=1.2.3	R
351	1	Total Firmware version	1	123 (hex) means version=1.2.3	R
358	1	Modbus communication status	1	0= No Error -1= CRC error -2= Timeout	R
360	1	Pair Connection	1	0=Normal 1=Timeout 2=Disconnected	R

- **(4xxxx) AO address**

Begin address	Points	Description	Registers per Point	Range	Access Type
555	1	CPU reset status	1	1= by power on 2= by 0.8 second WDT 3= by Reset command	R/W
556	1	CPU reset events	1	How many CPU reset events has happened? When CPU is reset by one of the situations described	R/W/E

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Begin address	Points	Description	Registers per Point	Range	Access Type
				in register 555, the event increases one count.	
557	1	Set host watch dog timer	1	<5: Disabled 5~65535: Enabled (unit: second) (default=0) When ET-7000/PET-7000 loses communication with PC more than the WDT setting, DO and AO go to their safe values and host WDT events plus 1 count.	R/W/E
558	1	Host WDT events	1	How many host WDT events have happened after CPU reset?	R/W
559	1	Module name	4	16 ASCII characters	R
563	1	Module nick name	8	16 ASCII characters	R/W/E

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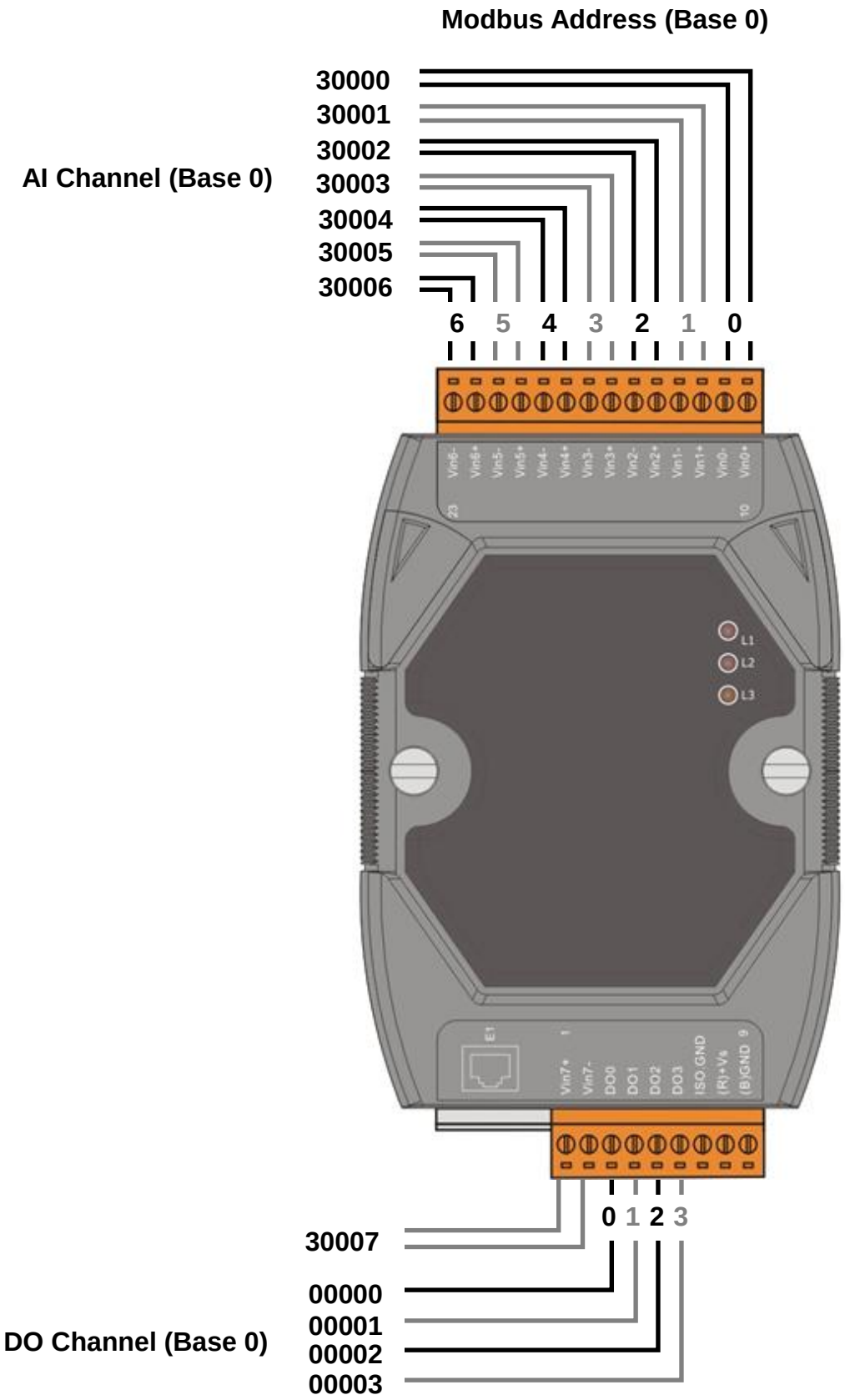
C.2. ET-7017/PET-7017 I/O Address Mapping



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Detailed Modbus Address Table for ET-7017/PET-7017 (D)

- **(0xxxx) DO address**

Begin address	Points	Description	Registers per Point	Range	Access Type
0	4	Digital Out	1	0=off 1=on	R/W
162	32	Clear AI Latch High	1	1=clear	W (Pulse)
194	32	Clear AI Latch Low	1	1=clear	W (Pulse)
347	1	Enable the average value of the previous AI values of one channel for all AI	1	0=disable 1=enable (Default=0)	R/W/E
348	1	Enable average of all enable channel, High/Low Alarm value of all AI average value and Average latched values for all AI channels	1	0=disable 1=enable (Default=0)	R/W/E
431	1	Write DO Power on value to EEPROM	1	1=write	W (Pulse)
432	1	Write DO Safe value to EEPROM	1	1=write	W (Pulse)
435	4	Power on value for DO	1	0=off 1=on (Default=0)	R/W/E
515	4	Safe value for DO	1	0=off 1=on (Default=0)	R/W/E
595	8	Enable/Disable AI channel	1	0=disable 1=enable (Default=1)	R/W/E
628	1	Normal/Fast mode for AI	1	0=normal (16 bit) 1=fast (12 bit) (Default=0)	R/W/E
629	1	50/60Hz rejection for AI	1	1=50Hz	R/W/E

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				0=60Hz (Default=0)	
631	1	AI data format	1	1=engineering 0=hex (Default=0)	R/W/E
632	1	Return the factory calibration (All)	1	1=clear	R/W/E
634	1	Clear AI Latch High (All)	1	1=clear	W (Pluse)
635	1	Clear AI Latch Low (All)	1	1=clear	W (Pluse)
636	8	AI Alarm High switch	1	0=disabled 1=enabled	R/W/E
668	8	AI Alarm Low switch	1	0=disabled 1=enabled	R/W/E
700	8	AI Alarm High mode	1	0=Moment 1=Latched	R/W/E
732	8	AI Alarm Low mode	1	0=Moment 1=Latched	R/W/E
764	8	AI High Alarm	1	0=OK 1=alarm (Clear)	R/W (Pulse)
796	8	AI Low Alarm	1	0=OK 1=alarm (Clear)	R/W (Pulse)
828	1	High Alarm of Average value of all AI channel	1	0=OK 1=alarm (Clear)	R/W (Pulse)
829	1	Low Alarm of Average value of all AI channel	1	0=OK 1=alarm (Clear)	R/W (Pulse)

- **(3xxxx) AI address**

Begin address	Points	Description	Registers per Point	Range	Access Type
0	8	Analog Input	word	-32768 ~	R

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				+32767	
144	8	Average value of one channel	word	-32768 ~ +32767	R
176	1	Average value of all enabled AI channel	word	-32768 ~ +32767	R
177	1	Average value of all maximum latched AI value	word	-32768 ~ +32767	R
178	1	Average value of all minimum latched AI value	word	-32768 ~ +32767	R
236	8	Analog Latched value (High)	word	-32768 ~ +32767	R
268	8	Analog Latched value (Low)	word	-32768 ~ +32767	R
310	1	DO (channel number)	word	0 ~ 79	R
311	1	Power on value for DO (channel number)	word	0 ~ 79	R
312	1	Safe value for DO (channel number)	word	0 ~ 79	R
320	1	AI (channel number)	word	0 ~ 16	R

- **(4xxxx) AO address**

Begin address	Points	Description	Registers per Point	Range	Access Type
59	1	Average times for every channel	word	0 ~ 40	R/W/E
174	1	Enable/Disable AI channel	word	0 ~ 65535	R/W
198	1	High alarm value for average value of all AI channel	word	0 ~ 65535 or -32768 ~ +32767	R/W/E
199	1	Low alarm value for average value of all AI channel	word	0 ~ 65535 or -32768 ~ +32767	R/W/E
296	8	High alarm value for AI	word	-32768 ~ +32767 (Default=32767)	R/W/E

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296	8	Low alarm value for AI	word	-32768 ~ +32767 (Default=-32768)	R/W/E
427	1	Type code for AI	word	Refer to type code table	R/W/E

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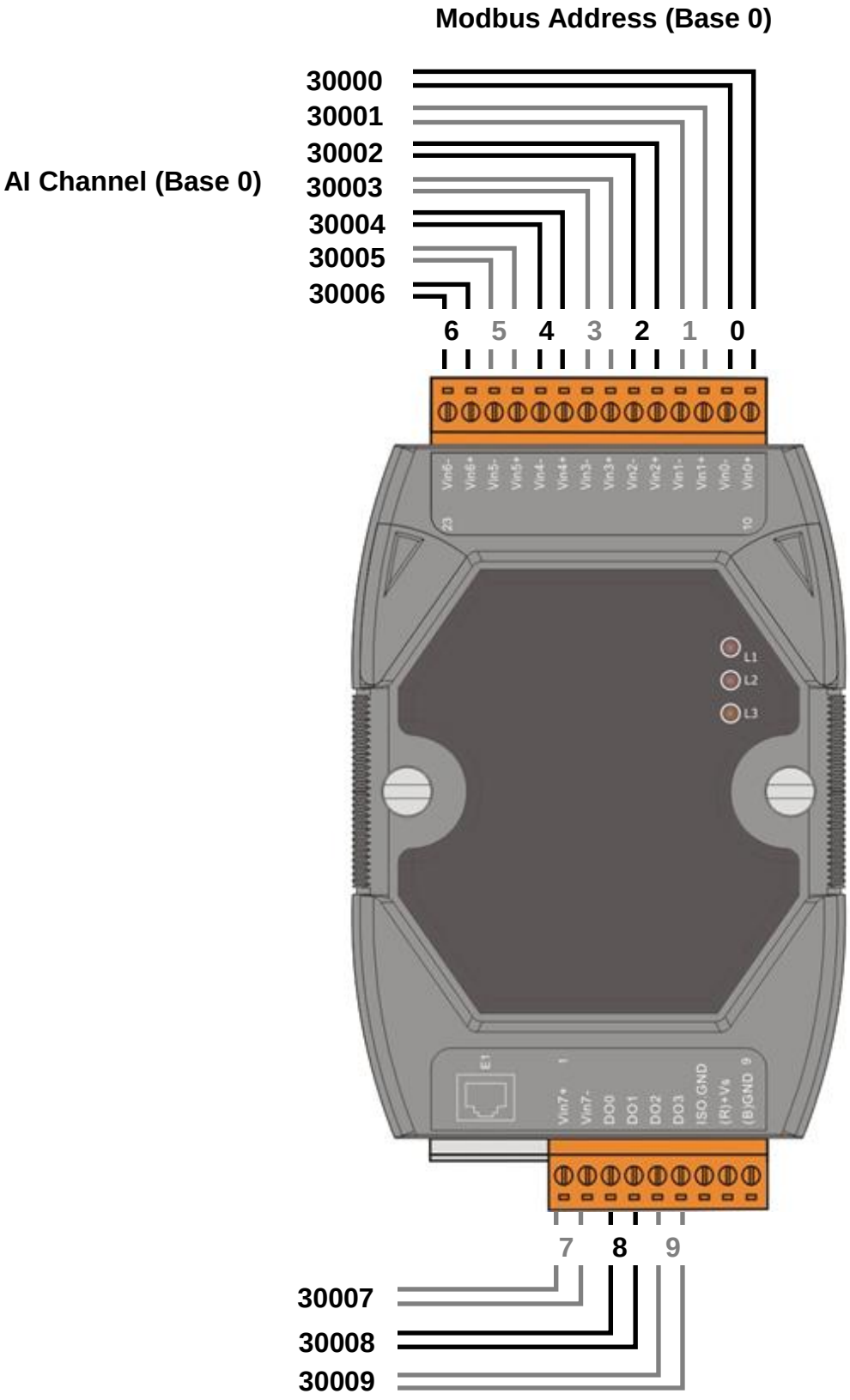
C.3. ET-7017-10 I/O Address Mapping



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Detailed Modbus Address Table for ET-7017/PET-7017 (D)

- **(0xxxx) DO address**

Begin address	Points	Description	Registers per Point	Range	Access Type
162	32	Clear AI Latch High	1	1=clear	W (Pulse)
194	32	Clear AI Latch Low	1	1=clear	W (Pulse)
347	1	Enable the average value of the previous AI values of one channel for all AI	1	0=disable 1=enable (Default=0)	R/W/E
348	1	Enable average of all enable channel, High/Low Alarm value of all AI average value and Average latched values for all AI channels	1	0=disable 1=enable (Default=0)	R/W/E
595	8	Enable/Disable AI channel	1	0=disable 1=enable (Default=1)	R/W/E
628	1	Normal/Fast mode for AI	1	0=normal (16 bit) 1=fast (12 bit) (Default=0)	R/W/E
629	1	50/60Hz rejection for AI	1	1=50Hz 0=60Hz (Default=0)	R/W/E
631	1	AI data format	1	1=engineering 0=hex (Default=0)	R/W/E
632	1	Return the factory calibration (All)	1	1=clear	R/W/E
634	1	Clear AI Latch High (All)	1	1=clear	W (Pluse)
635	1	Clear AI Latch Low (All)	1	1=clear	W (Pluse)
636	8	AI Alarm High switch	1	0=disabled	R/W/E

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				1=enabled	
668	8	AI Alarm Low switch	1	0=disabled 1=enabled	R/W/E
700	8	AI Alarm High mode	1	0=Moment 1=Latched	R/W/E
732	8	AI Alarm Low mode	1	0=Moment 1=Latched	R/W/E
764	8	AI High Alarm	1	0=OK 1=alarm (Clear)	R/W (Pulse)
796	8	AI Low Alarm	1	0=OK 1=alarm (Clear)	R/W (Pulse)
828	1	High Alarm of Average value of all AI channel	1	0=OK 1=alarm (Clear)	R/W (Pulse)
829	1	Low Alarm of Average value of all AI channel	1	0=OK 1=alarm (Clear)	R/W (Pulse)

- **(3xxxx) AI address**

Begin address	Points	Description	Registers per Point	Range	Access Type
0	8	Analog Input	word	-32768 ~ +32767	R
144	8	Average value of one channel	word	-32768 ~ +32767	R
176	1	Average value of all enabled AI channel	word	-32768 ~ +32767	R
177	1	Average value of all maximum latched AI value	word	-32768 ~ +32767	R
178	1	Average value of all minimum latched AI value	word	-32768 ~ +32767	R
236	8	Analog Latched value (High)	word	-32768 ~ +32767	R
268	8	Analog Latched value (Low)	word	-32768 ~ +32767	R
320	1	AI (channel number)	word	0 ~ 16	R

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- **(4xxxx) AO address**

Begin address	Points	Description	Registers per Point	Range	Access Type
59	1	Average times for every channel	word	0 ~ 40	R/W/E
174	1	Enable/Disable AI channel	word	0 ~ 65535	R/W
198	1	High alarm value for average value of all AI channel	word	0 ~ 65535 or -32768 ~ +32767	R/W/E
199	1	Low alarm value for average value of all AI channel	word	0 ~ 65535 or -32768 ~ +32767	R/W/E
296	8	High alarm value for AI	word	-32768 ~ +32767 (Default=32767)	R/W/E
296	8	Low alarm value for AI	word	-32768 ~ +32767 (Default=-32768)	R/W/E
427	1	Type code for AI	word	Refer to type code table	R/W/E

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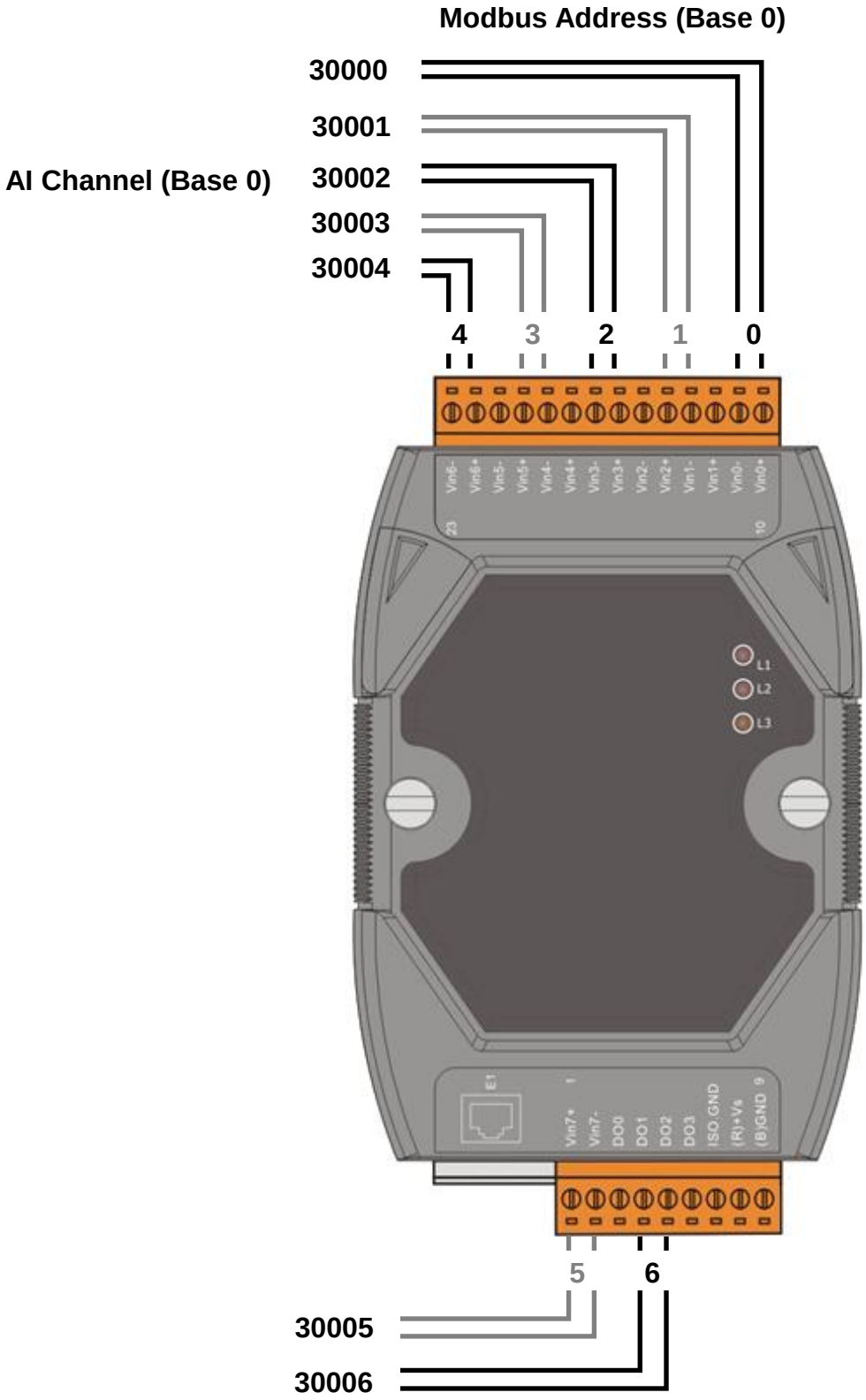
C.4. ET-7015/PET-7015 I/O Address Mapping



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Detailed Modbus Address Table for ET-7017/PET-7017 (D)

- **(0xxxx) DO address**

Begin address	Points	Description	Registers per Point	Range	Access Type
595	7	Enable/Disable AI channel	1	0=disable 1=enable (Default=1)	R/W/E
629	1	50/60Hz rejection for AI	1	0=50Hz 1=60Hz (Default=1)	R/W/E
631	1	AI data format	1	1=engineering 0=hex (Default=0)	R/W/E
632	1	Return the factory calibration (All)	1	1=clear	R/W/E
830	1	Enable/ Disable calibration(All)	1	0=disable 1=enable	R/W
831	1	Zero calibration command of ch0	1	1=run (pulse)	R/W
832	1	Span calibration command of ch0	1	1=run (pulse)	R/W
833	1	Zero calibration command of ch1	1	1=run (pulse)	R/W
834	1	Span calibration command of ch1	1	1=run (pulse)	R/W
835	1	Zero calibration command of ch2	1	1=run (pulse)	R/W
836	1	Span calibration command of ch2	1	1=run (pulse)	R/W
837	1	Zero calibration command of ch3	1	1=run (pulse)	R/W
838	1	Span calibration command of ch3	1	1=run (pulse)	R/W
839	1	Zero calibration command of ch4	1	1=run (pulse)	R/W
840	1	Span calibration command of ch4	1	1=run (pulse)	R/W
841	1	Zero calibration command of ch5	1	1=run (pulse)	R/W
842	1	Span calibration command of ch5	1	1=run (pulse)	R/W
843	1	Zero calibration command of ch6	1	1=run (pulse)	R/W
844	1	Span calibration command of ch6	1	1=run (pulse)	R/W

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- **(3xxxx) AI address**

Begin address	Points	Description	Registers per Point	Range	Access Type
0	7	Analog Input	word	-32768 ~ +32767	R

- **(4xxxx) AI address**

Begin address	Points	Description	Registers per Point	Range	Access Type
110	7	Temperature offset	word	-128 ~ 127	R/W/E
271	1	Modbus NetID	word	1 ~ 255	R/W
142	7	Resistance offset	word	0 ~ 255	R/W/E
427	7	Type code for AI	word	20 ~ 83 (hex)	R/W/E

- **Note:**

Unit of temperature offset is 0.1 °C, valid range: -128 ~ 127

Unit of resistance offset is 0.1 ohm, valid range: 0 ~ 255

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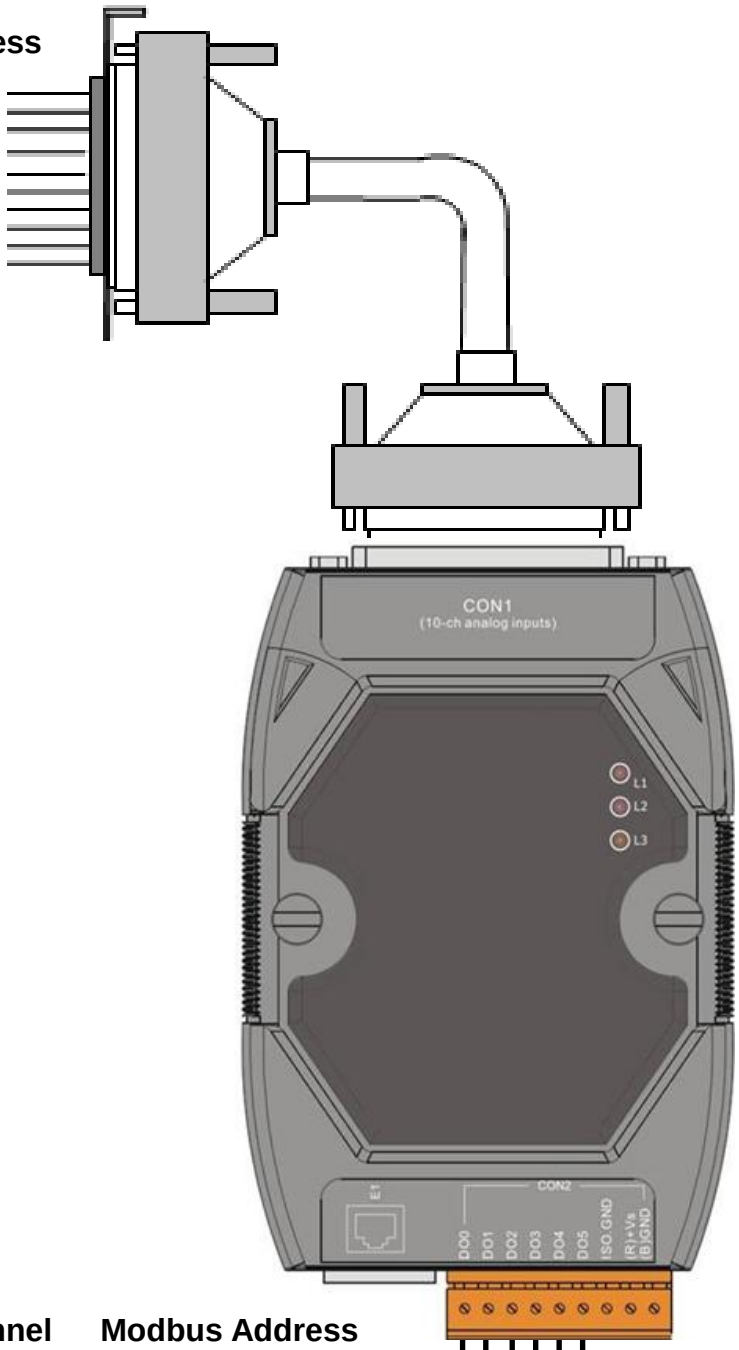
C.5. ET-7018Z/PET-7018Z I/O Address Mapping

AI Channel	Modbus address
AI0	30000
AI1	30001
AI2	30002
AI3	30003
AI4	30004
AI5	30005
AI6	30006
AI7	30007
AI8	30008
AI9	30009



DO Channel	Modbus Address
DO0	00000
DO1	00001
DO2	00002
DO3	00003
DO4	00004
DO5	00005

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Detailed Modbus Address Table for ET-7018Z/PET-7018Z

- **(0xxxx) DO address**

Begin address	Points	Description	Registers per Point	Range	Access Type
0	6	Digital Out	1	0=off 1=on	R/W
162	10	Clear AI Latch High	1	1=clear	W (pulse)
194	10	Clear AI Latch Low	1	1=clear	W (pulse)
347	1	Enable the average value of the previous AI values of one channel for all AI	1	0=disable 1=enable (default=0)	R/W/E
348	1	Enable average of all enable channel, High/Low Alarm value of all AI average value and Average latched values for all AI channels	1	0=disable 1=enable (default=0)	R/W/E
349	1	Save module nick name to EEPROM	1	1=write	W (pulse)
431	1	Write DO Power On value to EEPROM	1	1=write	W (pulse)
432	1	Write DO Safe value to EEPROM	1	1=write	W (pulse)
435	6	Power On value for DO	1	0=off 1=on (default=0)	R/W/E
515	6	Safe value for DO	1	0=off 1=on (default=0)	R/W/E
595	10	Enable/Disable AI channel	1	0=disable 1=enable (default=1)	R/W/E
627	1	Enable/Disable CJC	1	0=Disable 1=Enable (default=1)	R/W/E

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629	1	50/60Hz rejection for AI	1	0=50Hz 1=60Hz (default=1)	R/W/E
631	1	AI data format	1	1=engineering 0=hex (default=0)	R/W/E
632	1	Return the factory calibration (all)	1	1=clear	R/W (pulse)
634	1	Clear AI Latch High (all)	1	1=clear	W (pulse)
635	1	Clear AI Latch Low (all)	1	1=clear	W (pulse)
636	10	AI Alarm High switch	1	0=disabled high alarm 1=enabled high alarm	R/W/E
668	10	AI Alarm Low switch	1	0=disabled low alarm 1=enabled low alarm	R/W/E
700	10	AI Alarm High mode	1	0=Moment 1=Latched	R/W/E
732	10	AI Alarm Low mode	1	0=Moment 1=Latched	R/W/E
764	10	AI High Alarm	1	0=OK 1=alarm (clear)	R/W (pulse)
796	10	AI Low Alarm	1	0=OK 1=alarm (clear)	R/W (pulse)
828	1	High Alarm of Average value of all AI channel	1	0=OK 1=alarm (clear)	R/W (pulse)
829	1	Low Alarm of Average value of all AI channel	1	0=OK 1=alarm (clear)	R/W (pulse)
830	1	Enable/Disable calibration	1	0=disabled	R/W

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				1=enabled	
831	1	Zero calibration channel 0	1	1 = write	W (pulse)
832	1	Span calibration channel 0	1	1=write	W (pulse)

- **(1xxxx) Read Only Coils**

Begin address	Points	Description	Registers per Point	Range	Access Type
336	1	High alarm for the average value of all AI registers	1	0=ok 1=alarm	R
337	1	Low alarm for the average value of all AI registers	1	0=ok 1=alarm	R

- **(3xxxx) AI address**

Begin address	Points	Description	Registers per Point	Range	Access Type
0	10	Analog Input	word	-32768 ~ +32767	R
143	1	CJC temperature	word	-32768 ~ +32767	R
144	10	Average value of one channel	word	0 ~ 65535 or -32768 ~ +32767	R
176	1	Average value of all enabled AI channel	word	0 ~ 65535 or -32768 ~ +32767	R
177	1	Average value of all maximum latched AI value	word	0 ~ 65535 or -32768 ~ +32767	R
178	1	Average value of all minimum latched AI value	word	0 ~ 65535 or -32768 ~ +32767	R

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236	10	Analog Latched value (High)	word	0 ~ 65535 or -32768 ~ +32767	R
268	10	Analog Latched value (Low)	word	0 ~ 65535 or -32768 ~ +32767	R
310	1	DO (channel number)	word	0 ~ 79	R
311	1	Power on value for DO (channel number)	word	0 ~ 79	R
312	1	Safe value for DO (channel number)	word	0 ~ 79	R
320	1	AI (channel number)	word	0 ~ 16	R
350	1	OS image version	word	123 (hex) means version=1.2.3	R
351	1	Total firmware version	word	123 (hex) means version=1.2.3	R
352	1	CPU lib version	word	123 (hex) means version=1.2.3	R
353	1	I/O firmware version	word	123 (hex) means version=1.2.3	R
354	1	Xserver lib version	word	123 (hex) means version=1.2.3	R
355	1	TCP/IP lib version	word	123 (hex) means version=1.2.3	R
356	1	Modbus lib version	word	123 (hex) means version=1.2.3	R
357	1	Web lib version	word	123 (hex) means version=1.2.3	R

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358	1	Modbus communication status	word	0= no error -1=CRC error -2=timeout	R
360	1	Pair connection	word	0=normal 1=timeout 2=disconnected	R

- **(4xxxx) AI address**

Begin address	Points	Description	Registers per Point	Range	Access Type
59	1	Average times for every channel	word	0 ~ 40	R/W/E
174	1	Enable/Disable AI channel	word	0 ~ 65535	R/W
198	1	High alarm value for average value of all AI channel	word	0 ~ 65535 or -32768 ~ +32767	R/W/E
199	1	Low alarm value for average value of all AI channel	word	0 ~ 65535 or -32768 ~ +32767	R/W/E
271	1	Modbus address (Net ID)	word	1 ~ 255	R/W/E
296	10	High alarm value for AI	word	-32768 ~ +32767 (Default=32767)	R/W/E
328	10	Low alarm value for AI	word	-32768 ~ +32767 (Default=-32767)	R/W/E
427	10	Type code for AI	word	Refer to type code table	R/W/E
491	10	CJC offset of channel	word	-4096 ~ 4096 (unit = 0.01 ℃)	R/W/E
589		CJC update setting	word	0=stop CJC update 1=start CJC update 2=update CJC once only after this command is received	R/W/E

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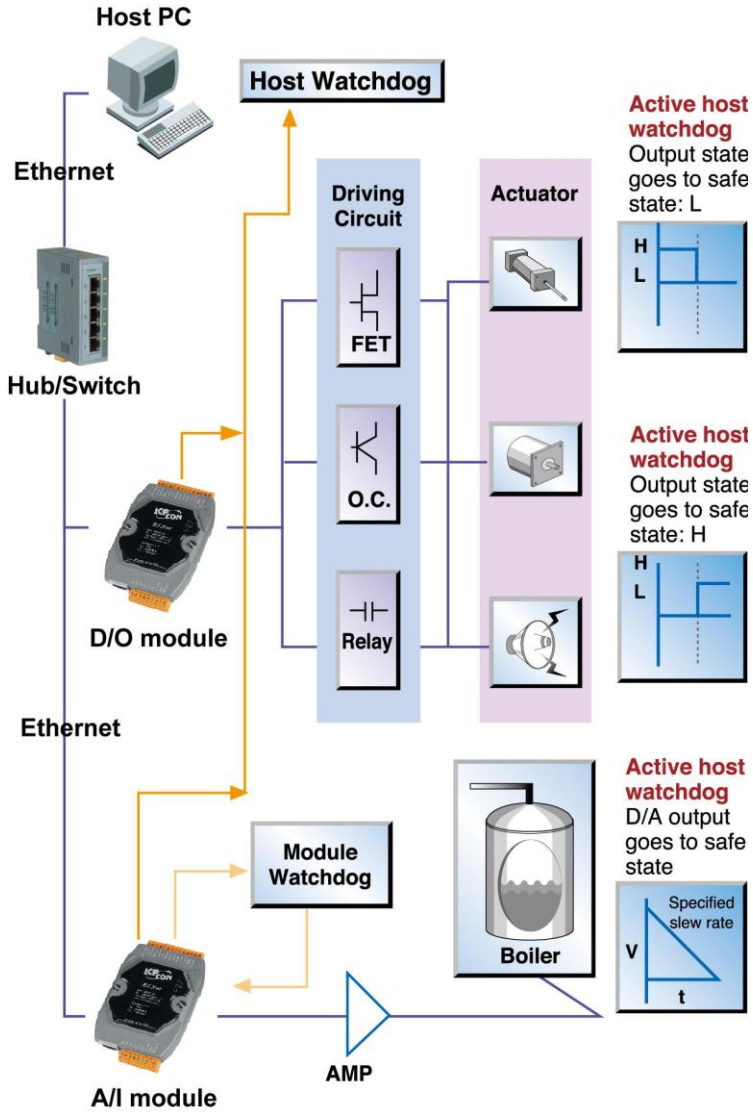
Appendix D. Modbus Application Notes

D.1. Dual Watchdog

Dual Watchdog consists of Module Watchdog and Host Watchdog.

1. The Module Watchdog is a built-in hardware circuit that will reset the CPU module if a failure occurs in either the hardware or the software. If the application does not refresh the watchdog timer within 0.8 seconds, the watchdog circuit will initiate a reset of the CPU.

2. The Host Watchdog is a software function that can be used to monitor the operating status of the host. Its purpose is to prevent network communication problems or a host failure. If the Watchdog timeout interval expires, the module will return all outputs to a predefined Safe value (Refer to the Safe Value application note), which can prevent the controlled target from unexpected situation.



AO address 40557 of the ET-7000/PET-7000 series Modbus register is the address of the Host Watchdog timer, and will be stored into EEPROM. The WDT function will be disabled if the value is set to less than 5 seconds.

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D.2. Power ON Value

If the ET-7000/PET-7000 series module is reset, the output of the module is set to the predefined Power ON Value for the DO and AO channels. DO address 00435 of the ET-7000/PET-7000 series Modbus register is the first address of the Power ON value, and the total number of channels depend on the type of module.

For example:
Addresses 00435 to 00438 records the Power ON value for the 4-Channel ET-7017/PET-7017.

Be careful to set the ON value to DO address 00431 to write the DO Power ON value to the EEPROM of the ET-7000/PET-7000 DO module after using Modbus commands (05 or 15) to change the Power ON value.

Configuration via Web page

Browse to the homepage of the ET-7000/PET-7000, and click the “Modbus I/O Settings” link in the Configuration Section of the Main Menu tree.

Click the ON/OFF radio box to set the power ON/OFF value and then click the button Submit to enable the settings to take effect.

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D.3. Safe Value

If the time of the Host PC losing Modbus/TCP communication with the module is greater than the host WatchDog timer setting (called WDT timeout), the output of the Digital and Analog channels is set to the Safe Value, and the count of the host WDT events is increased by one.

AO address 40558 is the address of the Host WDT events. The value of the WDT events will be not stored into EEPROM, and will return to 0 after the module is rebooted. DO address 00515 is the first address of the Safe value and the total number of channels depends on the type of module.

For example:
Address 00515 to 00518 records the Safe value for the 4-Channel ET-7017/PET-7017.

Be careful to set the ON value to DO address 00432 to write the DO Safe value to the EEPROM of the ET-7000/PET-7000 DO module after using Modbus commands (05 or 15) to change the Power ON value.

While the WDT timeout is set, the module can also receive the Modbus/TCP commands (05, 06, 15 and 16) to change the DO or AO value without needing to clear the host watchdog timeout value.

Configuration via Web page

Browse to the homepage of the ET-7000/PET-7000, and click the “Modbus I/O Settings” link in the Configuration Section of the Main Menu tree.

Click the ON/OFF radio box to set the Safe value and then click the Submit button to enable the settings to take effect.

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D.4. AI High/Low Alarm

ET-7017/PET-7017 and ET-7017-10 module equip with the High/Low Alarm function. When the alarm function is enabled, the specified registers are the alarm indicator. The alarm function is to compare the analog input value with given high alarm value and low alarm value.

Address 00636 to 00667 can be used to enable/disable the AI High Alarm function.

Address 00668 to 00699 can be used enable/disable the AI Low Alarm function.

- **ET-7017/PET-7017 AI High/Low Alarm Switch Table**

Channel Number	AI High Alarm		AI Low Alarm	
	Register	Description	Register	Description
AI0	00636	0: Disable/1: Enable	00668	0: Disable/1: Enable
AI1	00637	0: Disable/1: Enable	00669	0: Disable/1: Enable
AI2	00638	0: Disable/1: Enable	00670	0: Disable/1: Enable
AI3	00639	0: Disable/1: Enable	00671	0: Disable/1: Enable
AI4	00640	0: Disable/1: Enable	00672	0: Disable/1: Enable
AI5	00641	0: Disable/1: Enable	00673	0: Disable/1: Enable
AI6	00642	0: Disable/1: Enable	00674	0: Disable/1: Enable
AI7	00643	0: Disable/1: Enable	00675	0: Disable/1: Enable
AI8	00644	0: Disable/1: Enable	00676	0: Disable/1: Enable
AI9	00645	0: Disable/1: Enable	00677	0: Disable/1: Enable

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Address 40296 to 40327 records the High Alarm value. Address 40328 to 40359 records the Low Alarm value. By the default, the High Alarm value is 32767 and the Low Alarm value is -32768.

- **ET-7017/PET-7017 AI High/Low Alarm Value Table**

Channel Number	High Alarm Value of AI		Low Alarm Value of AI	
	Register	Description	Register	Description
AI0	40296	-32768 ~ 32767	40328	-32768 ~ 32767
AI1	40297	-32768 ~ 32767	40329	-32768 ~ 32767
AI2	40298	-32768 ~ 32767	40330	-32768 ~ 32767
AI3	40299	-32768 ~ 32767	40331	-32768 ~ 32767
AI4	40270	-32768 ~ 32767	40332	-32768 ~ 32767
AI5	40271	-32768 ~ 32767	40333	-32768 ~ 32767
AI6	40272	-32768 ~ 32767	40334	-32768 ~ 32767
AI7	40273	-32768 ~ 32767	40335	-32768 ~ 32767
AI8	40274	-32768 ~ 32767	40336	-32768 ~ 32767
AI9	40275	-32768 ~ 32767	40337	-32768 ~ 32767

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The analog input High/Low Alarm contains two alarm types, Momentary Alarm and Latch Alarm. Address 00700 of Modbus register can be used to set the High Alarm type of channel 0 and the total number of channels depends on the type of module. Address 00732 of Modbus register can be used to set the Low Alarm type of channel 0.

- **ET-7017/PET-7017 AI High/Low Type Value Table**

Channel Number	AI High Alarm Type		AI Low Alarm Type	
	Register	Description	Register	Description
AI0	00700	0: Momentary Alarm 1: Latch Alarm	00732	0: Momentary Alarm 1: Latch Alarm
AI1	00701	0: Momentary Alarm 1: Latch Alarm	00733	0: Momentary Alarm 1: Latch Alarm
AI2	00702	0: Momentary Alarm 1: Latch Alarm	00734	0: Momentary Alarm 1: Latch Alarm
AI3	00703	0: Momentary Alarm 1: Latch Alarm	00735	0: Momentary Alarm 1: Latch Alarm
AI4	00704	0: Momentary Alarm 1: Latch Alarm	00736	0: Momentary Alarm 1: Latch Alarm
AI5	00705	0: Momentary Alarm 1: Latch Alarm	00737	0: Momentary Alarm 1: Latch Alarm
AI6	00706	0: Momentary Alarm 1: Latch Alarm	00738	0: Momentary Alarm 1: Latch Alarm
AI7	00707	0: Momentary Alarm 1: Latch Alarm	00739	0: Momentary Alarm 1: Latch Alarm
AI8	00708	0: Momentary Alarm 1: Latch Alarm	00740	0: Momentary Alarm 1: Latch Alarm
AI9	00709	0: Momentary Alarm 1: Latch Alarm	00741	0: Momentary Alarm 1: Latch Alarm

The following are the descriptions for two alarm types.

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- **Momentary Alarm**

  The alarm status is cleared while the analog input is not exceeding the alarm value.

  For example:
  If analog input value of channel 0 (30001) > High Alarm value (40296), the address 00764 is 1, else it is 0.

  If analog input Value of channel 0 (30001) < Low Alarm value (40328), the address 00796 is 1, else it is 0.

  The address 00764 to 00795 is the High alarm indicator. If a High alarm occurred, the value of register is 1. In normal condition, it will be 0. The address 00796 to 00827 is the Low alarm indicator. If a Low alarm occurred, the value of register is 1. In normal condition, it will be 0.

- **Latch Alarm**

  When the Latch Alarm mode is enabled, the register stays latched until the specified registers are cleared.

  For example:
  If analog input value of channel 0 (30001) > High Alarm value (40296), the address 00764 is 1, else if analog input value of channel 0 (30001) < Low Alarm value (40328), the address 00796 is 1.

  The address 00764 to 00795 is the High alarm indicator. In normal condition, the value of register is 0. If a High alarm occurred, the value of register stays 1 until the address 00764 to 00795 is cleared. The address 00796 to 00827 is the Low alarm indicator. In normal condition, the value of register is 0. If a Low alarm occurred, the value of register stays 1 until the address 00796 to 00827 is cleared.

  The address 00764 to 00795 can be used to clear the High Latch Alarm. The address 00796 to 00827 can be used to clear the Low Latch Alarm.

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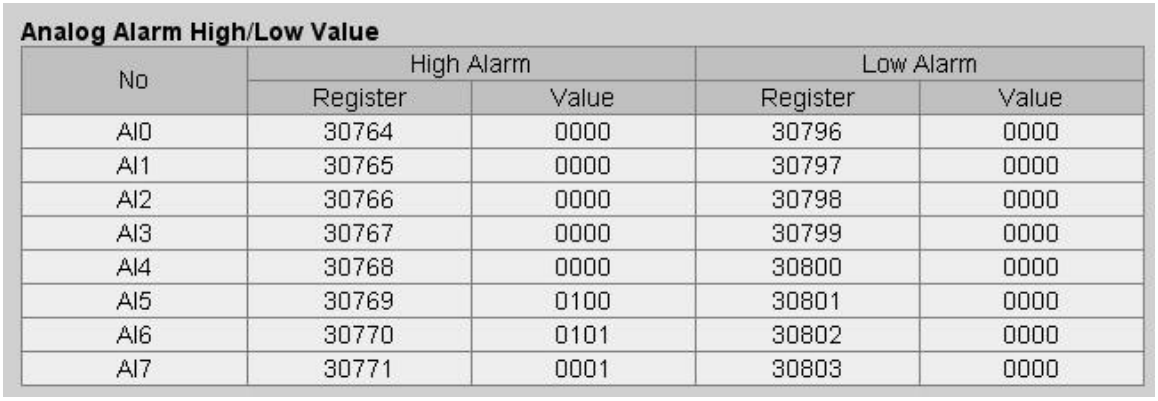
Configuration via Web page

Browse to the homepage of the ET-7000/PET-7000, and click the “Modbus I/O Settings” link in the Configuration Section of the Main Menu tree.

View the Power ON/Safe Value via Web page

Click the “Web HMI” link in the Web HMI Section of the Main Menu tree.



Analog Alarm High/Low Value

No	High Alarm		Low Alarm	
	Register	Value	Register	Value
AI0	30764	0000	30796	0000
AI1	30765	0000	30797	0000
AI2	30766	0000	30798	0000
AI3	30767	0000	30799	0000
AI4	30768	0000	30800	0000
AI5	30769	0100	30801	0000
AI6	30770	0101	30802	0000
AI7	30771	0001	30803	0000

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D.5. AI High/Low Latch

The address 30236 to 30267 records the maximum value of analog inputs and stays the value until another maximum input enters. The address 30268 to 30299 records the minimum value of analog inputs and stays the value until another minimum input enters.

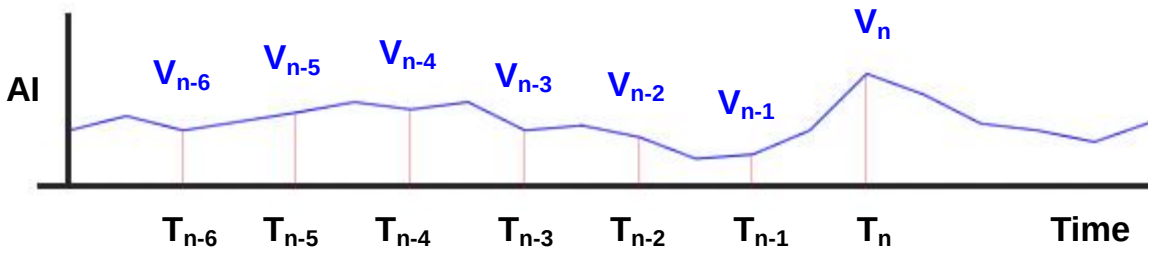
View the Power ON/Safe Value via Web page

Click the “Web HMI” link in the Web HMI Section of the Main Menu tree.

Analog Latched High/Low Value

No	Latched High		Latched Low	
	Register	Value	Register	Value
AI0	30236	0019	30268	FFD2
AI1	30237	0018	30269	FFED
AI2	30238	0021	30270	FFE5
AI3	30239	0016	30271	FFEC
AI4	30240	002A	30272	FFEC
AI5	30241	0018	30273	FFE0
AI6	30242	0018	30274	FFE9
AI7	30243	0013	30275	FFE9

Moving average value of one AI channel



$$V_{Ave\_n}=(V_n+V_{n-1}+V_{n-1}+V_{n-3}+\ldots+V_{n-6}) / 7 \quad (7: 7 \text{ records})$$

The average value of each AI can be reached on a regular interval when the moving average function is enabled.

For example, a five-item simple moving average would be the sum of the reading value of the five most recent reading value, divided by five; a 20-item moving average would be the sum of the 20 most recent reading value divided by 20, and so on. Each item the most recent reading value is added to the equation and the most distant item is dropped off.

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Register	Description
00347	Enable the moving value of the AI channels 0=disabled 1=enabled (Default=0)
40059	Average times for each AI channel 0 ~ 40

Address 30144 to 30153 recodes the average value of each AI channel.

- **ET-7017/PET-7017 Average value of one channel Table**

Channel Number	Register	Description
AI0	30144	0 ~65535 or –32768 ~ +32767
AI1	30145	0 ~65535 or –32768 ~ +32767
AI2	30146	0 ~65535 or –32768 ~ +32767
AI3	30147	0 ~65535 or –32768 ~ +32767
AI4	30148	0 ~65535 or –32768 ~ +32767
AI5	30149	0 ~65535 or –32768 ~ +32767
AI6	30150	0 ~65535 or –32768 ~ +32767
AI7	30151	0 ~65535 or –32768 ~ +32767
AI8	30152	0 ~65535 or –32768 ~ +32767
AI9	30153	0 ~65535 or –32768 ~ +32767

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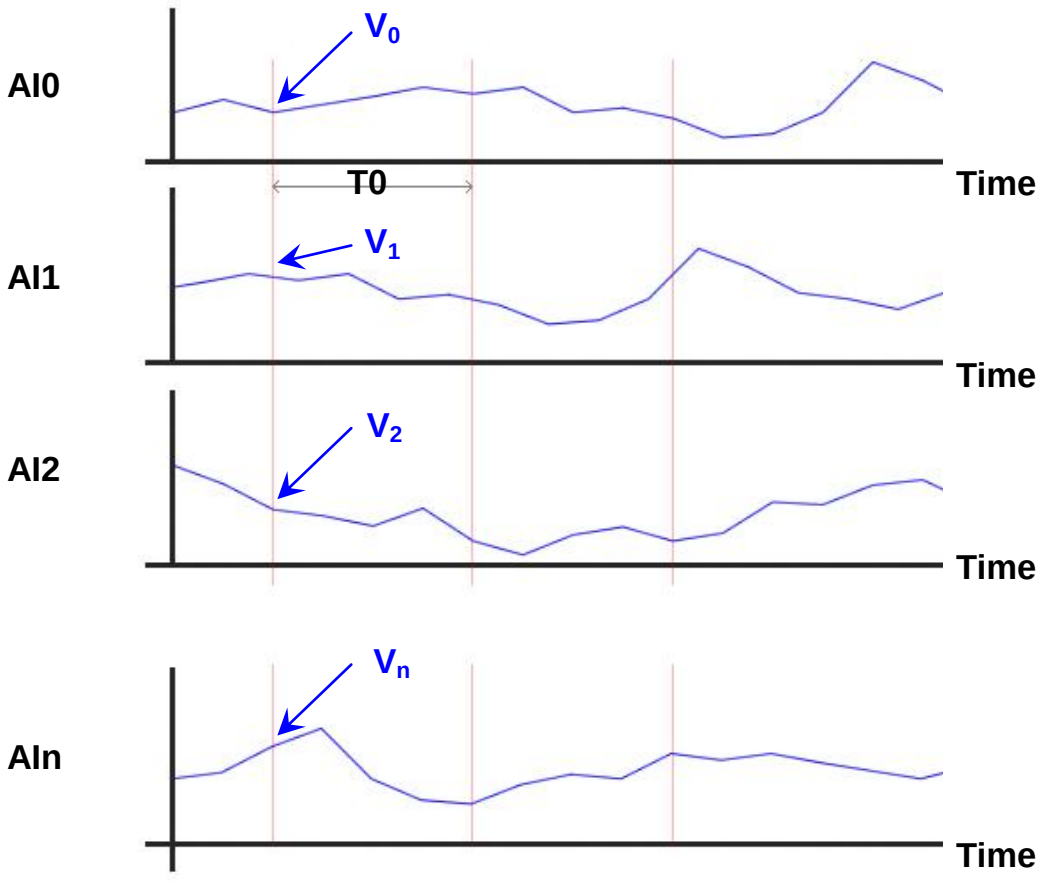
Average value of all AI channel

The value of all AI channel is obtained on a regular interval. The average of AI channels can be reached and then stored in the specified registers.

Register	Description
00348	Enable the average value of all enabled channels, High/Low Alarm value of all AI average value and Average Latched values. 0=disabled 1=enabled (Default=0)
30176	Average value of all enabled AI channel. Address 00595~00626 is used to enable/disable the AI channel. 0 ~ 65535 or –32768 ~ +32767



$V_{Ave\_all}=(V_0+V_1+V_2+V_3+\ldots+V_n) / n$ (n: n records)

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High/Low Alarm of the average value of all AI channels

The average value of all AI channels also can equip with the alarm function like the AI High/Low Alarm. For the detailed description, please refer the AI High/Low Alarm.

Register	Description
10336	High alarm for the average value of all AI registers 0=normal 1=alarm
10337	Low alarm for the average value of all AI registers 0=normal 1=alarm
40198	High alarm value for Average value of all AI channels 0 ~ 65535 or –32768 ~ +32767
40199	Low alarm value for Average value of all AI channels 0 ~ 65535 or –32768 ~ +32767

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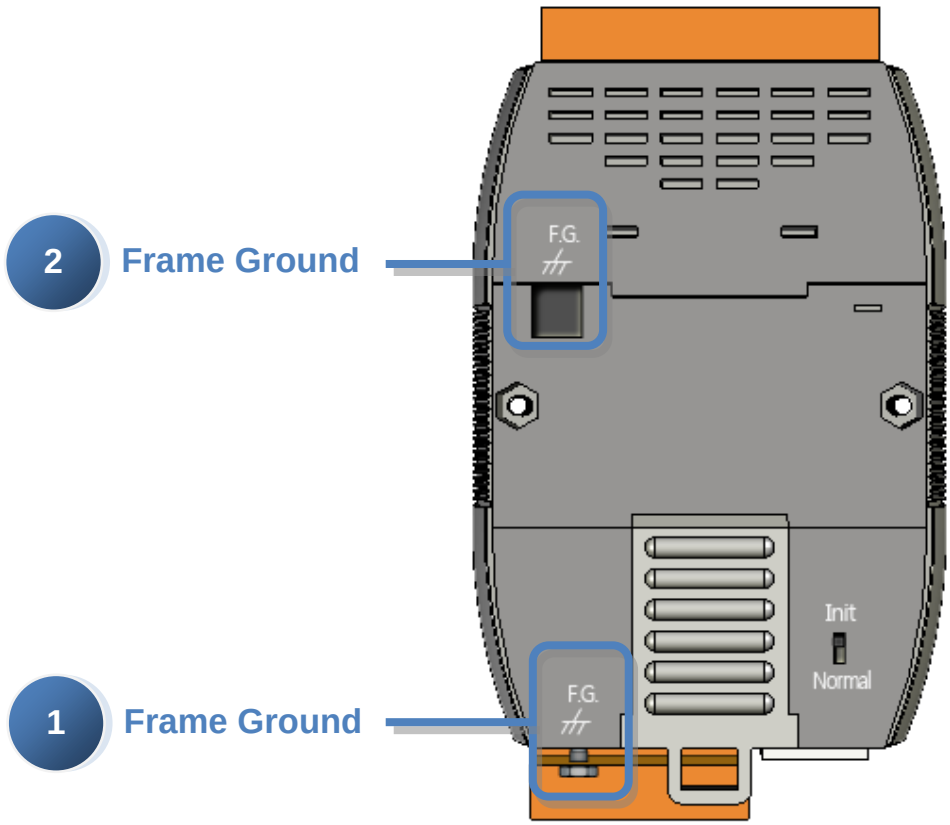
Appendix E. Frame Ground

Electronic circuits are constantly vulnerable to Electro-Static Discharge (ESD), which become worse in a continental climate area. ET-7000/PET-7000 series modules feature a new design for the frame ground, which provides a path for bypassing ESD, allowing enhanced static protection (ESD) capability and ensures that the module is more reliable.

The following options will provide a better protection for the module:

The ET-7000/PET-7000 controller has a metallic board attached to the back of the plastic basket as shown in the figure below, point 1.

When mounted to the DIN rail, connect the DIN rail to the earth ground because the DIN rail is in contact with the upper frame ground as shown in the figure below, point 2.



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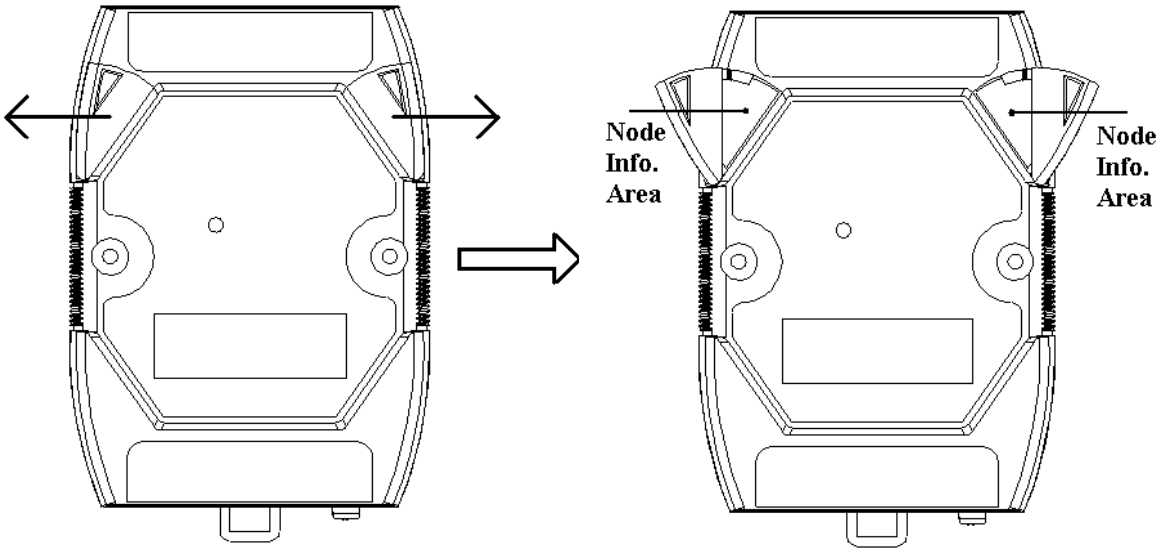
Appendix F. Node Information Area

Each ET-7000/PET-7000 module has a built-in EEPROM to store configuration information such as IP address, type code, etc. One minor drawback is that there are no visual indications of the configuration of the module. New ET-7000/PET-7000 modules include node information areas that are protected by a cover, as shown below, and can be used to make a written record of the node information, such as IP address, etc. To access the node information areas, first slide the covers outward, as shown in the figure below.



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Appendix G. Technical Support

Should you encounter problems while using your ET-7000/PET-7000 series module, and are unable to find the help you need in this manual or on our website, please contact ICP DAS Product Support.

Email: service@icpdas.com

Website: http://www.icpdas.com/service/support.htm

When requesting technical support, be prepared to provide the following information about your system:

1. Module name and serial number: The serial number can be found printed on the barcode label attached to the cover of the module.
2. Firmware and OS version: See Section 3.1 Overview for information regarding the command used to identify the firmware/OS version.
3. Host configuration: Host type and operating system (if needed).
4. If the problem is reproducible, please give full details describing the procedure used to reproduce the problem.
5. Specific error messages displayed. If a dialog box with an error message is displayed, please include the full text of the dialog box, including the text in the title bar.
6. If the problem involves other programs or hardware devices, please describe the details of the problem in full.
7. Any comments and suggestions related to the problem are welcome.

ICP DAS will reply to your request by email within three business days.

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